TETRA TECH, INC.
10306 Eaton Pl., Suite 340
Fairfax, VA 22030
Telephone (703) 385-6000
FAX (703) 385-6007

January 13, 2006

MEMORANDUM FOR DISTRIBUTION

Subj: Final Environmental Assessment and draft Finding of No Significant Impact for implementation of the Residential Communities Initiative at Redstone Arsenal, Alabama (December 2005)

Redstone Arsenal, Alabama, and the U.S. Army Corps of Engineers, Mobile District, have prepared an environmental assessment (EA) to evaluate the potential environmental and socioeconomic effects associated with the privatization of family housing on the Arsenal. At the request of the U.S. Army Corps of Engineers, Mobile District, this memorandum transmits the final EA and the draft Finding of No Significant Impact (FNSI) for public review.

The final EA and draft FNSI are available for review and comment for 30 days from the publication of a Notice of Availability in the *Huntsville Times*, Huntsville, Alabama. The Notice of Availability was published on January 13, 2006, and the public comment period will end on February 13, 2006. All comments on the final EA and FNSI should be sent to Mr. Russell Pearsall at U.S. Army Garrison, AMSAM-RA-DPW-MP-RCI, Bldg 4488, Room A307B, Redstone Arsenal, AL 35898-5000. For more information, or to request a copy of the document, please contact Mr. Pearsall at Redstone Arsenal at 256-955-8577.

Sincerely,

Samuel Pett
Project Manager
sam.pett@tetratech-ffx.com

Atch
DISTR

Huntsville Main Library
Redstone Arsenal Public Affairs Office
Redstone Arsenal Post Library
Redstone Arsenal Scientific Information Center
USEPA, Region 4
Wheeler National Wildlife Refuge
Alabama Historical Commission
Advisory Council on Historic Preservation

Final
Environmental Assessment for the Residential Communities Initiative at Redstone Arsenal, Alabama

prepared for

Commander, Redstone Arsenal, Alabama

by

US Army Corps of Engineers Mobile District

with Technical Assistance from

Tetra Tech, Inc.
Fairfax, Virginia 22030
December 2005

ENVIRONMENTAL ASSESSMENT

IMPLEMENTATION OF THE ARMY RESIDENTIAL COMMUNITIES INITIATIVE AT REDSTONE ARSENAL, ALABAMA

Prepared by:

MOBILE DISTRICT
U.S. ARMY CORPS OF ENGINEERS

1/4/06

Peter F. Taylor, Jr.
Colonel, Engineer
Commanding

Approved by:

REDSTONE ARSENAL, ALABAMA

for Darrell Brewer

John A. Olshefski
Colonel, OD
Commanding

December 2005

ENVIRONMENTAL ASSESSMENT

***LEAD AGENCY*:** Redstone Arsenal, Alabama

***TITLE OF PROPOSED ACTION*:** Implementation of the Army Residential Communities Initiative at Redstone Arsenal, Alabama

***AFFECTED JURISDICTION*:** The City of Huntsville, Madison County, Alabama

***PREPARED BY*:** Peter F. Taylor, Jr., Colonel, U.S. Army Corps of Engineers, Mobile District, Commanding

***APPROVED BY*:** John A. Olshefski, Colonel, OD, Redstone Arsenal, Alabama, Commanding

***ABSTRACT*:** This Environmental Assessment (EA) considers the proposed implementation of the Army's Residential Communities Initiative at Redstone Arsenal, Alabama. The EA identifies, evaluates, and documents the effects of obtaining private sector funding for construction, maintenance, management, renovation, replacement, rehabilitation, and development of family housing and ancillary supporting facilities. A no action alternative is also evaluated. Implementation of the proposed action is not expected to result in significant environmental impacts. Therefore, preparation of an Environmental Impact Statement is not required and a Finding of No Significant Impact (FNSI) will be published in accordance with the Army's National Environmental Policy Act regulation.

***REVIEW COMMENT DEADLINE*:** The EA and draft FNSI are available for review and comment for 30 days, beginning January 25, 2006, through February 24, 2006. Copies of the EA and draft FNSI can be obtained by contacting Mr. Russell Pearsall at U.S. Army Garrison, AMSAM-RA-DPW-MP-RCI, Bldg 4488, Room A307B, Redstone Arsenal, AL 35898-5000, or by e-mail requests to russell.l.pearsall@us.army.mil. The documents are available for review at the Huntsville Main Library (915 Monroe St., Huntsville) and on the installation at the Public Affairs Office (5300 Martin Rd), the Post Library (Bldg 3323), and the Scientific Information Center (Bldg 4484). The documents can also be reviewed online at http://www.garrison.redstone.army.mil/sites/directorates/dpw/emd/emd_home.asp. Comments on the EA and draft FNSI should be submitted to Mr. Pearsall at the physical address or email address given above by no later than February 24, 2006.

ENVIRONMENTAL ASSESSMENT ORGANIZATION

This Environmental Assessment addresses the proposed action to implement the Residential Communities Initiative at Redstone Arsenal, Alabama. It has been developed in accordance with the National Environmental Policy Act and implementing regulations issued by the Council on Environmental Quality (Title 40 *Code of Federal Regulations* [CFR] 1500–1508) and the Army (32 CFR 651). Its purpose is to inform decision-makers and the public of the likely environmental and socioeconomic consequences of the proposed action and alternatives.

An ***EXECUTIVE SUMMARY*** briefly describes the proposed action, environmental and socioeconomic consequences, and mitigation measures.

TABLE OF CONTENTS

SECTION 1.0: ***PURPOSE, NEED, AND SCOPE FOR THE PROPOSED ACTION*** summarizes the purpose of and need for the proposed action and describes the scope of the environmental impact analysis process.

SECTION 2.0: ***PROPOSED ACTION*** describes the proposed action to implement the Residential Communities Initiative at Redstone Arsenal.

SECTION 3.0: ***ALTERNATIVES*** examines alternatives to implementing the proposed action.

SECTION 4.0: ***AFFECTED ENVIRONMENT AND CONSEQUENCES*** describes the existing environmental and socioeconomic setting at Redstone Arsenal and identifies potential effects of implementing the proposed action.

SECTION 5.0: ***FINDINGS AND CONCLUSIONS*** summarizes the environmental and socioeconomic effects of implementing the proposed action.

SECTION 6.0: ***REFERENCES*** provides bibliographical information for cited sources.

SECTION 7.0: ***LIST OF PREPARERS*** identifies the persons who prepared the document.

SECTION 8.0: ***PERSONS CONSULTED*** provides a listing of persons and agencies consulted during preparation of this Environmental Assessment.

SECTION 9.0: ***DISTRIBUTION LIST*** indicates recipients of this Environmental Assessment.

APPENDICES

- ***A*** Draft Community Development and Management Plan Brief
- ***B*** Record of Non-Applicability
- ***C*** Agency Correspondence
- ***D*** Economic Impact Forecast System
- ***E*** Solid Waste Calculations

ACRONYMS AND ABBREVIATIONS

EXECUTIVE SUMMARY

INTRODUCTION

The Army operates and maintains approximately 90,000 family housing units at its installations throughout the United States. More than 75 percent of the units do not meet current Army housing standards. Despite this situation, at most installations demand for adequate housing on base exceeds supply. The lack of adequate on-base housing forces many soldiers and their families to live in housing in need of repair or renovation or to live off-base where the cost and quality of housing vary considerably. Often, the costs to soldiers and their families to live off-base are 15 to 20 percent greater than the costs to live on-base. The Army estimates that as much as $6 billion would be needed to bring up its housing to current standards and to address the deficit of housing.

In recognition of these problems, Congress enacted Section 2801 of the 1996 Defense Authorization Act (Public Law 104-106, codified at Title 10 of the United States Code [U.S.C.] Sections 2871-85). Also known as the Military Housing Privatization Initiative (MHPI), this provision of law creates alternative authorities for improvement and construction of military family housing. The legislative intent of Congress in enacting these additional authorities is to enable the military to obtain private sector funding to satisfy family housing requirements. By leveraging scarce public funding, the Army can obtain private sector funds for construction, maintenance, management, renovation, replacement, rehabilitation, and development of Army family housing and ancillary supporting facilities.[1] The Army's implementation of the MHPI authorities is known as the Army Residential Communities Initiative (RCI).

BACKGROUND

Redstone Arsenal consists of 38,100 acres in the southwest portion of Madison County, Alabama. The installation is approximately 100 miles north of Birmingham, Alabama, and 180 miles west of Atlanta, Georgia. Redstone Arsenal serves as the headquarters location for the U.S. Army Aviation and Missile Command, the installation's host command. Additional Army elements include the U.S. Army Ordnance, Munitions and Electronics Maintenance School (a training activity of the U.S. Army Training and Doctrine Command), U.S. Army Test, Measurement, and Diagnostic Equipment Activity, U.S. Army Logistics Support Activity, and the U.S. Army Redstone Technical Test Center. The National Aeronautics and Space Administration operates the George C. Marshall Space Flight Center at the Arsenal. There are 459 family housing units on the installation.

The age and condition of Redstone Arsenal family housing units vary. Nearly half of the housing units are more than 30 years old. The sizes, configurations, safety, and condition of these older housing units are substantially below the Army's standards of acceptability. These older units lack amenities such as family rooms, laundry/utility space, adequate exterior storage, and auxiliary eating areas such as eat-in kitchens or breakfast nooks. Several housing units have potential health and safety concerns associated with the presence of lead-based paint, asbestos-containing material, and pesticides applied for pest control. Of the 459 housing units at Redstone Arsenal, the Army deems 170 of the housing units at Redstone Arsenal not adequate. Without

[1] According to 10 U.S.C. 2871, the term *ancillary supporting facilities* means "facilities related to military housing units, including child care centers, day care centers, tot lots, community centers, housing offices, dining facilities, unit offices, and other similar facilities for the support of military housing."

adequate funding to address the renovation backlog, housing units could potentially decline to a condition where they could be unsuitable for occupancy.

PROPOSED ACTION AND ALTERNATIVES

Consistent with the MHPI authorities, Redstone Arsenal proposes to transfer responsibility for providing housing and ancillary supporting facilities to Redstone Army Family Housing, LLC (RAFH), a limited liability company composed of the Army and Investment Builders, Inc., a private development company. Redstone Arsenal would convey all military housing units and selected ancillary support facilities and grant a 50-year ground lease for the areas on which the housing and facilities are located to RAFH. Redstone Arsenal would also grant a lease of additional areas for RAFH's use to construct new housing and to operate ancillary supporting facilities.

The purpose of the proposed action is to improve Army family housing and ancillary supporting facilities at Redstone Arsenal. The proposed action is needed to provide affordable, quality housing and ancillary supporting facilities to soldiers and their families through a combination of replacement of and improvement to existing family housing units to have them meet current Army standards. Redstone Arsenal expects RAFH to achieve the following goals:

- Ensure that eligible soldiers and their families have access to quality, attractive, and affordable housing by upgrading inadequate existing family housing and by building new housing to address substandard housing conditions at Redstone Arsenal.
- Improve the appearance and functions of the residential community while preserving historic properties, protecting other cultural resources, and meeting environmental stewardship responsibilities, including recycling of household commodities.
- Provide ancillary supporting facilities that enhance Redstone Arsenal's residential community.
- Maintain positive relations with the communities that surround Redstone Arsenal.
- Provide for the effective management and operation of existing, renovated, and new housing units and ancillary supporting facilities on a long-term basis.

Development of the Community Development Management Plan (CDMP), the agreement ultimately negotiated by and between Redstone Arsenal and RAFH, was an iterative process in which the plan was fine-tuned to meet Redstone Arsenal's needs for attaining affordable, quality housing and other facilities as well as minimizing or avoiding any potential environmental effects.

In accordance with the CDMP, Redstone Arsenal proposes to convey all of its 459 existing family housing units in 7 housing areas, existing housing maintenance facilities, and other ancillary support facilities to RAFH and to provide RAFH with a 50-year land lease of approximately 430 acres with a 25-year renewal clause. RAFH proposes to do major renovations on as many as 85 program units and as many as two manager homes, modernize as many as 22 program units, make improvements to as many as 118 program units, add amenities and minor improvements to as many as 120 interim units, and demolish as many as 222 units. The Initial Development Plan (IDP) would be implemented over a 3-year period beginning in October 2006, with all construction and demolitions in the IDP being completed within 3 years. Family housing units located in Area 1 and part of Area 6 (120 units total) will be retained as "interim housing units" for no longer than 17 years, being demolished no later than the 17th year of the project, or approximately October 2023. The required program units plus the allowed interim units sets the inventory at 350 units for years 1 through 17, and then reduces the inventory to the required program inventory of 230 units in 2023.

Redstone Arsenal identified four alternatives for its proposed action, as well as the no action alternative. Implementation of the proposed action is Redstone Arsenal's preferred alternative. Use of various MHPI authorities, proposed for and identified in the CDMP put forth by RAFH and negotiated by Redstone Arsenal, would achieve the purpose of and need for the proposed action. Alternatives to the proposed action that were considered include partial privatization, in which only a portion of family housing would fall under the RCI. Army housing in good condition could remain subject to Army management. This alternative, however, would delay actions to provide adequate housing for some soldiers and their dependents, would not be cost efficient, and, thus, would not fully meet the Army's purpose of and need for the proposed action. Under an alternative in which Redstone Arsenal would rely wholly on the private sector for family housing needs, Redstone Arsenal would terminate family housing programs, dispose of existing family housing units, and convert the land supporting housing areas to other uses. Reliance solely on the private sector would create conditions leading to poor morale, and abandonment of existing on-post family housing would not be fiscally responsible. When it comes to the alternative of leasing property, two key statutory authorities come into play: "Section 801 Housing" (long-term leasing of housing) and "Section 802 Housing" (rental guarantees for housing). Although use of either or both of these authorities would be possible, their use would not be reasonable when compared to the far more flexible and economic advantages of the new authorities offered by the RCI to the Army and to soldiers' families. Accordingly, these alternatives were considered unreasonable under the circumstances and, therefore, were not further evaluated. As prescribed by Council on Environmental Quality regulations, the environmental assessment (EA) evaluates the no action alternative, which would consist of the Army continuing to provide for the family housing needs of its personnel through use of traditional military construction and maintenance funding through the Congressional authorization and appropriations process.

The EA analyzes the proposed action (the Army's preferred alternative) and a no action alternative. The focus is on evaluation of environmental effects that could occur in the first 10 years of implementation of the CDMP (through 2017). Prediction of potential environmental effects for the years beyond 2017 would be increasingly speculative and, therefore, is not attempted.

ENVIRONMENTAL CONSEQUENCES

The EA evaluates potential effects on land use, aesthetics and visual resources, air quality, noise, geology and soils, water resources, biological resources, cultural resources, socioeconomics (including environmental justice and protection of children), transportation, utilities, and hazardous and toxic substances. For each resource, the predicted effects from both the proposed action, identified as the Army's preferred alternative, and the no action alternative are briefly described below.

Consequences of the Proposed Action

Land Use

Long-term minor beneficial effects on installation land use would be expected. No land use incompatibilities would be expected because no housing construction is planned for areas outside existing housing areas. RAFH would increase buffer space around the family housing by eliminating Housing Area 1 and the easternmost portions of Area 6. This would be beneficial by helping to separate housing from other land uses, as well as help interconnect the neighborhoods to create more cohesive communities.

No effects on surrounding land use would be expected.

Aesthetic and Visual Resources

Short-term minor adverse and long-term moderate beneficial effects would be expected. Construction activities are inherently displeasing aesthetically. During the construction and renovation phase of the RCI program, vistas from various vantage points on the installation would be intruded upon by construction equipment, construction material staging areas, and bare land dotted with buildings undergoing construction or demolition. These effects, however, would be short-term and localized to the areas under construction.

Beneficial effects would also be expected from implementing the CDMP. Manifestation of the CDMP developed by RAFH would achieve aesthetically harmonious communities through the use of cohesive and regionally appropriate architectural design characteristics, landscape planning that focuses on using native plant species and screening visually intrusive structures and activities, and the inclusion of green space. As a result of the RCI, the overall aesthetic appeal of the housing areas would be greatly improved.

Air Quality

Short-term minor adverse effects would be expected. Construction equipment would generate air pollutants in addition to those already emitted at the installation. Because the installation is in an area that is in attainment for all criteria pollutants, a general conformity review is not required.

Noise

Short-term minor adverse and long-term minor beneficial effects on noise levels in the housing areas would be expected. Implementation of the proposed action would result in noise exposure during the construction phase due to the operation of construction equipment and construction activities in general. Long-term benefits would be realized by removing housing from Housing Areas 1 and 6, the conversion of the vacated areas to green space, and adding additional green space in other areas of the footprint.

Geology and Soils

Topography. No effects on topography would be expected.

Geology. No effects would be expected. Housing construction would occur only on previously developed areas. Sinkholes, therefore, would not be expected to be a construction issue. If a sinkhole were found, remedial action in accordance with Redstone Arsenal procedures would be taken.

Soils. Short-term minor adverse effects would be expected. In the short term, soil erosion would likely result from ground disturbance by construction equipment.

Prime Farmland. No effects would be expected.

Water Resources

Surface Water. Short-term negligible adverse effects on surface waters would be expected. Erosion following soil-disturbing construction activities could lead to a short-term increase in surface runoff to McDonald Creek.

Groundwater. No effects on groundwater resources would be expected.

Floodplains. No effects would be expected.

Biological Resources

Short- and long-term negligible adverse effects on vegetation and wildlife would be expected. Vegetation and wildlife habitat within the RCI footprint are highly disturbed except for some forest edges on the periphery. Landscaping vegetation in existing housing areas could be

damaged or removed during the RCI project. New landscaping using native species, however, would be planted following construction. Common wildlife species habituated to human presence would be expected to be displaced during housing construction and to return after the construction was completed. No impacts on federally or state-listed threatened or endangered species or species of concern would be expected because these species are not present in or adjacent to the RCI footprint.

Short-term negligible indirect adverse effects on wetlands would be expected. Wetland areas near Housing Areas 1, 6, and 10a would not be directly affected by the RCI program, though an indirect effect as sediment runoff from construction areas could occur. If required, RAFH would obtain a U.S. Army Corps of Engineers Section 404 permit and the permit would specify any required compensatory mitigation.

Cultural Resources

No effects on cultural resources would be expected from implementation of the proposed action. If unknown deposits or remains were to be discovered during construction, activities would cease until the appropriate installation personnel, as well as the Alabama SHPO, were contacted and a determination was made regarding the NRHP eligibility of the site. If NRHP-eligible, the sites would be treated in accordance with procedures outlined in the ICRMP and in consultation with the Alabama SHPO, which would help ensure their preservation. No cemeteries within the RCI footprint would be expected to be affected.

Socioeconomics

Economic development and demographics. Short-term direct and indirect minor beneficial effects would be expected. The expenditures associated with demolition, construction, and renovation of family housing units and associated facilities at Redstone Arsenal would increase sales volume, employment, and income in the ROI, as determined by the EIFS model. The action would create about 135 jobs, increase income by more than $4 million, and business sales by about $18 million. The economic benefits would be short-term, lasting only for the duration of the development period. These changes in sales volume, employment, and income would fall within historical fluctuations (i.e., within the RTV range) and be considered minor. No change in ROI population would be expected. Soldiers would move from off-post to on-post housing, but no change in the number of soldiers stationed at Redstone Arsenal would occur under the proposed action.

Housing. Long-term major direct beneficial effects on on-post family housing would be expected. Implementing the RCI at Redstone Arsenal would ensure that eligible soldiers and their families would have access to quality, attractive, and affordable housing. The proposed action would improve the condition and aesthetic appeal of on-post family housing through revitalization of existing units and construction of new units. The rent for the new and revitalized housing would not exceed a soldier's BAH.

Quality of life. Short-term direct minor adverse and long-term direct beneficial effects on quality of life would be expected. In the short term, noise and traffic from construction of RCI housing could be disruptive to the existing residents. In the long term, however, overall quality of life for soldiers and their families would be greatly improved through implementation of the RCI at Redstone Arsenal because of the improved condition of on-post family housing, as well as the overall residential community. The proposed action would improve the condition and aesthetic appeal of existing housing through revitalization and construction of new housing, and it would heighten the sense of community through improved and linked open spaces, trail systems to connect neighborhoods, and community centers. The following paragraphs identify the foreseen effects for each of the key components of quality of life.

Law Enforcement and Fire Protection. No effects on law enforcement or fire protection services would be expected. Although the housing units would be sold to the developer, the land on which the buildings stand would only be leased to the developer (i.e., the land would continue to be federal government property). Therefore, Redstone Arsenal would retain legislative jurisdiction. The MP and the installation's fire department would still respond to emergencies in the family housing areas. In addition, because the number of on-post family housing units would not increase, no effects on the demand for law enforcement or fire protection services would be expected to result from implementation of the proposed action.

Medical Services. No effects on medical services would be expected. Implementation of the RCI would not change the eligible population of active duty military, military dependents, or retirees in the region serviced by on-post and civilian facilities.

Schools. Long-term minor adverse effects would be expected. The proposed action would reduce the number of family housing units on-post by 229 units. More families would live off-post. Because schools receive a lower level of federal impact aid for children living off-post, federal impact aid to schools would decrease.

Family Support Services. No effects on family services would be expected. The eligible population of active duty military, dependents, and retirees in the region would not change.

Shops and Services. No effects on shops and services would be expected. The eligible population of active duty military, dependents, and retirees in the region would not change.

Recreation. Long-term beneficial effects would be expected to result from implementation of the proposed action. The RCI could also include additional ancillary supporting facilities, such as walking trails, parks, recreation areas, and community centers. Along with the existing facilities that already serve Redstone Arsenal residents, these additional facilities would accommodate the new housing areas and improve recreational opportunities throughout the housing developments.

Environmental justice. No effects would be expected. Implementation of RCI would not result in disproportionate adverse environmental or health effects on low-income or minority populations.

Protection of children. Short-term minor adverse and long-term beneficial effects on the protection of children would be expected. In the short term, because construction sites can be enticing to children, construction activity could be an increased safety risk. During construction, safety measures stated in 29 CFR Part 1926, Safety and Health Regulations for Construction, and AR 385-10, Army Safety Program, would be followed to protect the health and safety of residents on Redstone Arsenal, as well as construction workers. Barriers and "no trespassing" signs would be placed around construction sites to deter children from playing in those areas, and construction vehicles and equipment would be secured when not in use.

Long-term beneficial effects on children would be expected because of reduced exposure to hazardous materials. Hazardous materials (including asbestos-containing materials and lead-based paint) identified in Redstone Arsenal housing units would be abated through removal or encapsulation during renovation or demolition activities. New construction would not use building products containing hazardous materials. These actions would eliminate children's possible exposure to such hazardous materials in on-post family housing.

Transportation

Short-term minor adverse and long-term minor beneficial effects on transportation would be expected. During RCI construction and renovation, traffic congestion could increase from the addition of construction vehicles, particularly during rush hours. Construction vehicles also would likely increase wear and tear on installation roads. Some roads might require additional

maintenance and road closures to accommodate utility construction and installation would be expected and would create short-term traffic delays.

Because of the long-term reduction in housing inventory, long-term beneficial effects on housing area traffic would be expected. Long-term beneficial effects would also be expected from roadway changes made during housing development. Simpson Drive would become a cul-de-sac and Crowell Cricle and Tripp Drive would be removed. These changes would reduce pass-through traffic in the housing areas.

Utilities

Utility Systems. Long-term beneficial effects on utility systems would be expected. Under the proposed action, the number of housing units would decrease while the on-post population would not be affected. Utility demand for residential use, therefore, would be expected to decrease over the long-term. Renovation of many units with energy-efficient appliances and low-flow water fixtures, and installation of the same in new units, could reduce the demand on utilities from baseline levels. All utilities have sufficient capacity to handle any increased demand during the construction phase of the project.

Storm water. No effects would be expected.

Landfills and Solid Waste. Long-term minor adverse effects on landfills would be expected. The installation landfill could adequately handle the C&D debris from the proposed demolition and renovation during the initial 30-month development period of the RCI project. RAFH could also choose to use an off-post landfill with sufficient capacity for disposal of the C&D debris. Nevertheless, disposal of debris from the RCI project would reduce the available volume of the chosen landfill for other purposes.

No effects on the quantity of solid waste generated by family housing residents would be anticipated from the discontinuation of support for the current household recycling program. It is anticipated that RAFH would continue the program with the current or another contractor.

Hazardous and Toxic Substances

Long-term minor beneficial effects would be expected. ACM and LBP present in existing housing units at Redstone Arsenal would be handled in a manner consistent with applicable rules and regulations, and thus no environmental or health effects resulting from the removal, handling, and disposal of these materials would be expected. There would be an overall reduction in ACM and LBP in residential areas. The actual and potential ACM and interior and exterior LBP would be removed from post housing units or encapsulated during demolition or renovation activities.

No environmental or health effects would be expected to result from the removal, handling, and disposal of hazardous materials during demolition or renovation activities, from pesticide use, from hazardous waste disposal, or from radon and mold.

Cumulative Effects

Non-RCI construction projects proposed on Redstone Arsenal that are in the vicinity of the RCI footprint would be the primary source of cumulative effects. Cumulative effects on air quality, noise, and traffic would be expected. Because effects caused by construction projects are short-lived and generally confined to a small area surrounding the projects, none of the effects would be expected to be significant.

Consequences of the No Action Alternative

Only those resources that would be affected by the no action alternative are discussed below.

Aesthetics and Visual Resources

Long-term minor adverse effects would be expected. Under the no action alternative, the Army would continue to be responsible for maintenance and renovation of existing housing and for new housing construction as necessary. Lack of sufficient funding for this work and the existence of an extensive backlog of work indicate that housing overall would deteriorate over time. Such deterioration would be expected to adversely affect the visual and aesthetic quality of the housing areas.

Socioeconomics

Housing and quality of life. Long-term minor adverse effects would be expected. Continuation of current family housing programs would perpetuate deficiencies in quality of life for soldiers and their dependents. The availability of affordable, quality family housing is a key factor in quality of life and is often given high priority by soldiers and their families. The Army would continue to do regular maintenance on existing housing, as well as some renovation and demolition, but it would be on a constrained budget over approximately a 30-year period, compared to the 10-year period under the proposed action. Over the 30 years, some housing units would deteriorate, becoming unsuitable for occupancy. This would decrease the inventory of family housing on Redstone Arsenal, forcing military employees and their families to find off-post housing. Depending on the person's rank and number of dependents, he or she could pay more than the MAHC for off-post housing that meets the family's needs.

Protection of children. Long-term minor adverse effects on the protection of children would be expected. Under current conditions the hazardous materials identified in on-post housing units are not health hazards because they have been contained or removed. As homes would deteriorate, however, the risk of children's exposure to hazardous materials (such as chipping lead-based paint or cracked asbestos-containing tiles) would increase. Section 4.12 provides further information on the types of hazardous materials identified in Redstone Arsenal housing units.

Hazardous and Toxic Substances

Long-term minor adverse effects could occur. Because of the extensive maintenance backlog and budget constraints, housing units might contain special hazards such as LBP and ACM. Redstone Arsenal would continue to abate these potential hazards in accordance with applicable laws, but abatement would extend over a much longer period than that under the proposed action, thereby increasing the possibility of exposure.

Cumulative Effects

No cumulative effects would be expected to result from implementation of the no action alternative. Table ES-1 summarizes the predicted effects for each resource area from both the proposed action, identified as the Army's preferred alternative, and the no action alternative.

MITIGATION

Mitigation actions for the proposed Army RCI project would be incorporated into the CDMP. Mitigation actions would be expected to reduce, avoid, or compensate for most adverse effects.

Table ES-2 summarizes the proposed mitigation measures to be taken for each of the affected resources.

CONCLUSIONS

Based on the analysis performed in this EA, implementation of the preferred alternative would have no significant direct, indirect, or cumulative effects on the quality of the natural or human

environment. Preparation of an Environmental Impact Statement is not required. Issuance of a Finding of No Significant Impact would be appropriate.

Table ES-1
Summary of Potential Environmental and Socioeconomic Consequences

	Environmental and Socioeconomic Consequences	
Resource Area	**Proposed Action**	**No Action Alternative**
Land Use	Long-term minor beneficial	No effects
Aesthetic and Visual	Short-term minor adverse Long-term moderate beneficial	Long-term minor adverse
Air Quality	Short-term minor adverse	No effects
Noise	Short-term minor adverse Long-term minor beneficial	No effects
Geology and Soils		
• Topography	No effects	No effects
• Geology	No effects	No effects
• Soils	Short-term minor adverse	No effects
• Prime farmland	No effects	No effects
Water Resources		
• Surface water	Short-term negligible adverse	No effects
• Groundwater	No effects	No effects
• Floodplains	No effects	No effects
Biological Resources		
• Vegetation and wildlife	Short- and long-term negligible adverse	No effects
• Listed species	No effects	No effects
• Wetlands	Short-term negligible indirect adverse	No effects
Cultural Resources	No effects	No effects
Socioeconomics		
• Economic development and demographics	Short-term minor beneficial	No effects
• Housing and quality of life	Long-term major beneficial	Long-term minor adverse
• Other quality of life	Short- and long-term minor adverse Long-term moderate beneficial	No effects
• Environmental justice	No effects	No effects
• Protection of children	Short-term minor adverse Long-term minor beneficial	Long-term minor adverse
Transportation	Short-term minor adverse Long-term minor beneficial	No effects
Utilities		
• Utility systems	Long-term beneficial	No effects
• Storm water	No effects	No effects
• Landfills	Long-term minor adverse effects on landfills	No effects
Hazardous and Toxic Substances	Long-term minor beneficial	Long-term minor adverse

Table ES-2
Summary of Mitigation Measures

Land Use

- Adhere to guidelines outlined in the Redstone Arsenal Real Property Master Plan when renovating housing areas.
- Coordinate site planning for the new housing units with the design of other proposed construction projects in the vicinity of the RCI footprint to minimize potential adverse effects on both on- and off-post residents.

Aesthetics and Visual Resources

- Design housing units in a regionally appropriate architectural style.
- Revegetate housing areas with native vegetation.
- Maintain trees and native vegetation wherever possible.
- Place new utility lines underground to improve aesthetics.

Air Quality

- Spray water on work sites to reduce fugitive dust emissions.

Noise

- Limit construction activities to daylight hours.
- Consider the incorporation of tree buffers or other noise-attenuating measures into community designs to separate noise-producing land uses from housing areas.

Geology and Soils

- Avoid construction near existing sinkholes. Perform site evaluations for potential sinkholes. Implement remedial actions, such as filling or plugging, if necessary.
- Use state-recommended BMPs to minimize soil erosion and sedimentation in surface waters.

Water Resources

- Implement state-recommended BMPs to control soil erosion and runoff.
- Implement a SWPPP.
- Reseed and revegetate area following construction activities to minimize sedimentation.

Biological Resources

- Implement RCI guidelines to preserve natural features in new housing developments and landscape yards and roadsides with native vegetation.
- Obtain and implement all requirements of a U.S. Army Corps of Engineers wetland permit if wetlands are disturbed, including any required mitigation actions.

Socioeconomics and Protection of Children

- Secure construction vehicles and equipment when not in use.
- Place barriers and "no trespassing" signs around construction sites where practicable.
- Avoid the use of building products containing hazardous materials.

Traffic and Transportation

- Route and schedule all RCI construction vehicle traffic to minimize traffic delays and congestion.
- Locate construction material staging areas to minimize traffic impacts.
- Incorporate traffic-calming measures in the vicinity of housing.
- Incorporate overall design improvements, such as walkways and bicycle paths, to reduce reliance on vehicles and to create more connected, pedestrian-friendly communities.

Utilities

Potable Water

- No mitigation is necessary; however, install water-efficient control devices, such as low-flow showerheads, faucets, and toilets, in all new facilities.

Energy

- No mitigation is necessary; however, install energy-efficient interior and exterior lighting fixtures and controls in all new units. All new units would be built to EnergyStar energy efficiency standards.

Recycling

- No mitigation is necessary; however, household commodities (e.g., newspaper, magazines, alkaline batteries, used motor oil, aluminum and steel cans, and plastic bottles and jugs) shall be collected as part of the RAFH residential curbside recycling program.

Table ES-2
Summary of Mitigation Measures (cont.)

Hazardous and Toxic Substances
• Before initiating renovation activities, evaluate environmental impacts and address in accordance with the appropriate regulatory requirements.
• Implement measures to control airborne asbestos and lead dust.
• Conduct lead-in-soil testing before construction activities and address in accordance with regulatory requirements.
• Perform evaluation and disposal of excavated soils contaminated with lead, pesticides/chlordane, and hazardous materials in accordance with applicable regulations.
• Perform evaluation and disposal of demolition materials in accordance with applicable regulations at the time of demolition.
• Establish smoking areas and prohibit open flames near flammable materials.
• Use proper storage and handling, paying attention to tasks at hand, and responsible driving.

CONTENTS

SECTION 1.0

PURPOSE, NEED, AND SCOPE FOR THE PROPOSED ACTION

1.1 BACKGROUND

The Army operates and maintains approximately 90,000 family housing units at its installations throughout the United States. More than 75 percent of the units do not meet current Army housing standards. Despite this, at most installations demand for adequate housing on-post exceeds supply. The lack of adequate on-post housing forces many soldiers and their families to live in housing in need of repair or renovation or to live off-post, where the cost and quality of housing vary considerably. Often, the costs to soldiers and their families to live off-post are 15 to 20 percent greater than the costs to live on-post. The Army estimates that as much as $6 billion would be needed to bring its housing up to current standards and to address the deficit of housing.

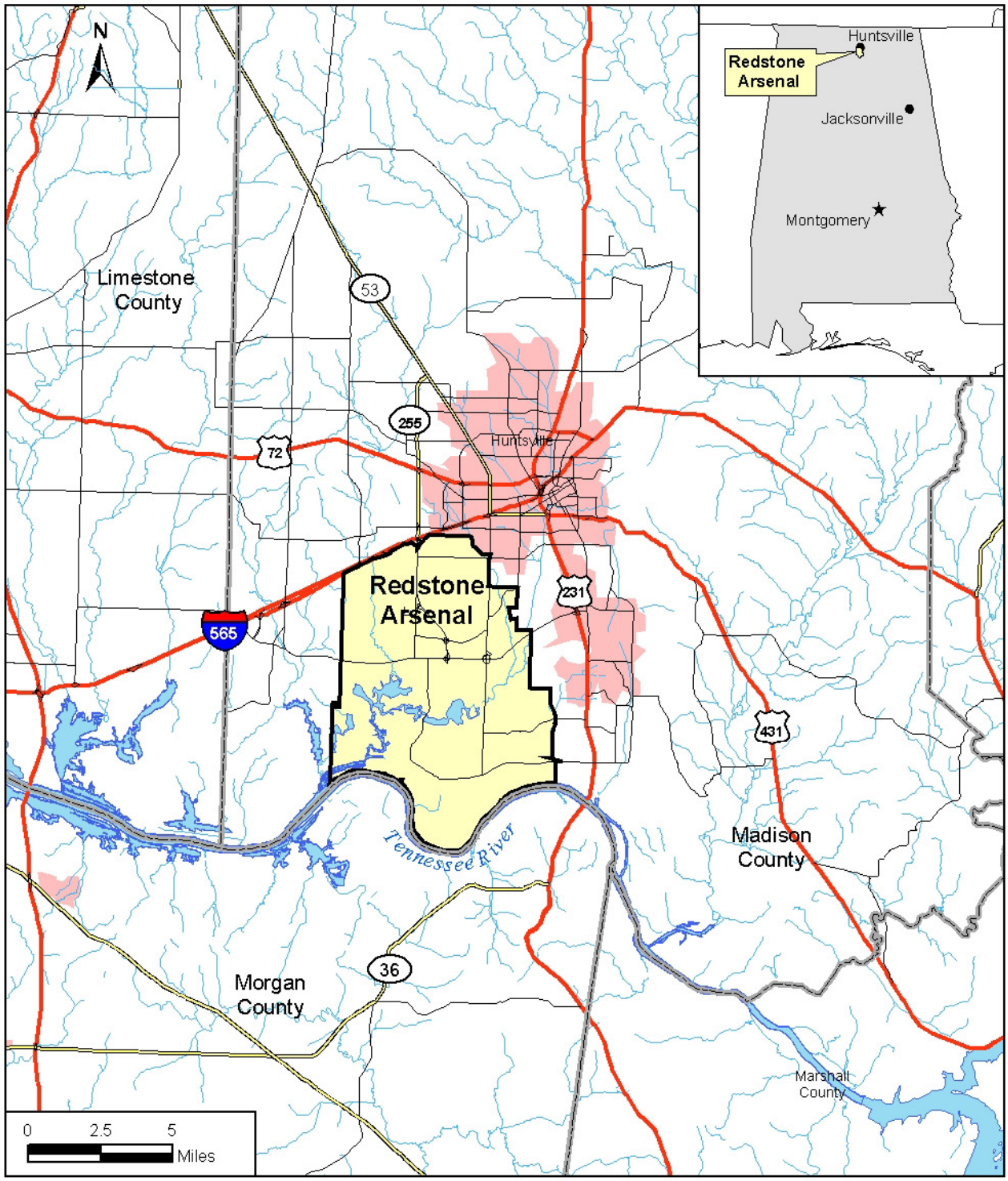
In recognition of these problems, Congress enacted Section 2801 of the 1996 Defense Authorization Act (Public Law 104-106, codified at Title 10 of the *United States Code* [U.S.C.] Sections 2871-85). Also known as the Military Housing Privatization Initiative (MHPI), this provision of law creates alternative authorities for improvement and construction of military family housing. The legislative intent of Congress in enacting these additional authorities is to enable the military to obtain private sector funding to satisfy family housing requirements. By leveraging scarce public funding, the Army can obtain private sector funds for construction, maintenance, management, renovation, replacement, rehabilitation, and development of Army family housing and ancillary supporting facilities.[1] The Army's implementation of the MHPI authorities is known as the Army Residential Communities Initiative (RCI).

Redstone Arsenal covers 38,100 acres in the southwest portion of Madison County, Alabama. The installation is approximately 100 miles north of Birmingham, Alabama, and 180 miles west of Atlanta, Georgia. It serves as the headquarters location for the U.S. Army Aviation and Missile Command, the installation's host command. Additional Army elements include the U.S. Army Ordnance, Munitions and Electronics Maintenance School (OMEMS), a training activity of the U.S. Army Training and Doctrine Command; U.S. Army Test, Measurement, and Diagnostic Equipment Activity; U.S. Army Logistics Support Activity; and U.S. Army Redstone Technical Test Center. The National Aeronautics and Space Administration (NASA) operates the George C. Marshall Space Flight Center at the Arsenal. There are 459 family housing units on the installation. The location of Redstone Arsenal is shown in Figure 1-1.

1.2 PURPOSE OF AND NEED FOR THE PROPOSED ACTION

Consistent with the MHPI authorities, Redstone Arsenal proposes to transfer responsibility for providing housing and ancillary supporting facilities to Redstone Army Family Housing, LLC (RAFH), a limited liability company composed of the Army and Investment Builders, Inc., a private development company. Redstone Arsenal would convey all military housing units and selected ancillary support facilities and grant a 50-year ground lease for the areas on which the housing and facilities are located to RAFH. Redstone Arsenal would also grant a lease of

[1] According to 10 U.S.C. 2871, the term *ancillary supporting facilities* means "facilities related to military housing units, including child care centers, day care centers, tot lots, community centers, housing offices, dining facilities, unit offices, and other similar facilities for the support of military housing."



LEGEND

- Installation Boundary
- County Boundary
- Urban Areas
- 565 Interstate Highway
- 72 U.S. Highway
- 53 State Highway

Installation Location

Figure 1-1

additional areas for RAFH's use to construct new housing and to operate ancillary supporting facilities.

The purpose of the proposed action is to improve Army family housing and ancillary supporting facilities at Redstone Arsenal. The proposed action is needed to provide affordable, quality housing and ancillary supporting facilities to soldiers and their families through a combination of replacement of and improvement to existing family housing units to have them meet current Army standards. Redstone Arsenal expects RAFH to achieve the following goals:

- Ensure that eligible soldiers and their families have access to quality, attractive, and affordable housing by upgrading inadequate existing family housing and by building new housing to address housing conditions at Redstone Arsenal.
- Improve the appearance and functions of the residential community, while preserving historic properties, protecting cultural resources, and meeting environmental stewardship responsibilities, including recycling of household commodities.
- Provide ancillary supporting facilities that enhance Redstone Arsenal's residential community.
- Maintain positive relations with the communities that surround Redstone Arsenal.
- Provide for the effective management and operation of existing, renovated, and new housing units and ancillary supporting facilities on a long-term basis.

The age and condition of Redstone Arsenal's family housing units vary. Nearly half of the housing units are more than 30 years old. The sizes, configurations, safety, and condition of the older housing units are substantially below the Army's standards of acceptability. These units lack amenities like family rooms, laundry/utility space, adequate exterior storage, and auxiliary eating areas such as eat-in kitchens or breakfast nooks. Several housing units have potential health and safety concerns associated with the presence of lead-based paint, asbestos-containing materials, and pesticides applied for pest control. Of the 459 housing units at Redstone Arsenal, the Army deems 170 of the units inadequate. Without sufficient funding to address the renovation backlog, housing units could become unsuitable for occupancy.

1.3 SCOPE OF ANALYSIS

This environmental assessment (EA) has been developed in accordance with the National Environmental Policy Act (NEPA) and implementing regulations issued by the Council on Environmental Quality (CEQ) (Title 40 of the *Code of Federal Regulations* [CFR] Parts 1500–1508) and the Army (32 CFR Part 651). Its purpose is to inform decisionmakers and the public of the likely environmental consequences of the proposed action and alternatives.

The EA identifies, documents, and evaluates the potential environmental effects of implementing the Army RCI at Redstone Arsenal. Section 2.0 describes the proposed action. Section 3.0 sets forth alternatives to the proposed action, including a no action alternative, and explains why certain alternatives are not evaluated in detail. Section 4.0 describes existing environmental conditions at Redstone Arsenal that could be affected by the proposed action and identifies potential environmental effects that could occur upon implementation of each of the alternatives evaluated. Section 5.0 presents findings and conclusions regarding the potential environmental effects of the proposed action.

This EA evaluates the environmental and socioeconomic effects that would be expected to occur upon implementation of the proposed action as reflected in the Community Development Management Plan (CDMP), the agreement ultimately negotiated by and between Redstone

Arsenal and RAFH. Because of cost, financial, environmental, or other reasons, certain choices, such as alternative housing sites, housing densities, housing formats (high-rise vs. low-rise), types of ancillary supporting facilities, and timing of specific Redstone Arsenal actions, were eliminated from further consideration during CDMP negotiations.

An interdisciplinary team of environmental scientists, biologists, ecologists, geologists, planners, economists, engineers, archaeologists, historians, lawyers, and military technicians reviewed the proposed action in light of existing conditions and has identified relevant beneficial and adverse effects associated with the action. The EA focuses on effects likely to occur within the project area, which generally consists of the present family housing areas and new parcels to be used for family housing. The document analyzes direct effects (those caused by the proposed action and occurring at the same time and place) and indirect effects (those caused by the proposed action and occurring later in time or farther removed in distance but still reasonably foreseeable). The potential for cumulative effects is also addressed, and mitigation measures are identified where appropriate.

This EA focuses on evaluation of environmental effects that are reasonably foreseeable, within approximately the first 10 years of the implementation of the CDMP (through 2016), described in detail in Section 2.2.1. This is the period during which RAFH would accomplish demolition, renovation, and new construction of family housing, as well as operation and maintenance of those housing units and the ancillary supporting facilities. Potential environmental effects beyond 2016 would be speculative, and therefore they are not analyzed in this EA.

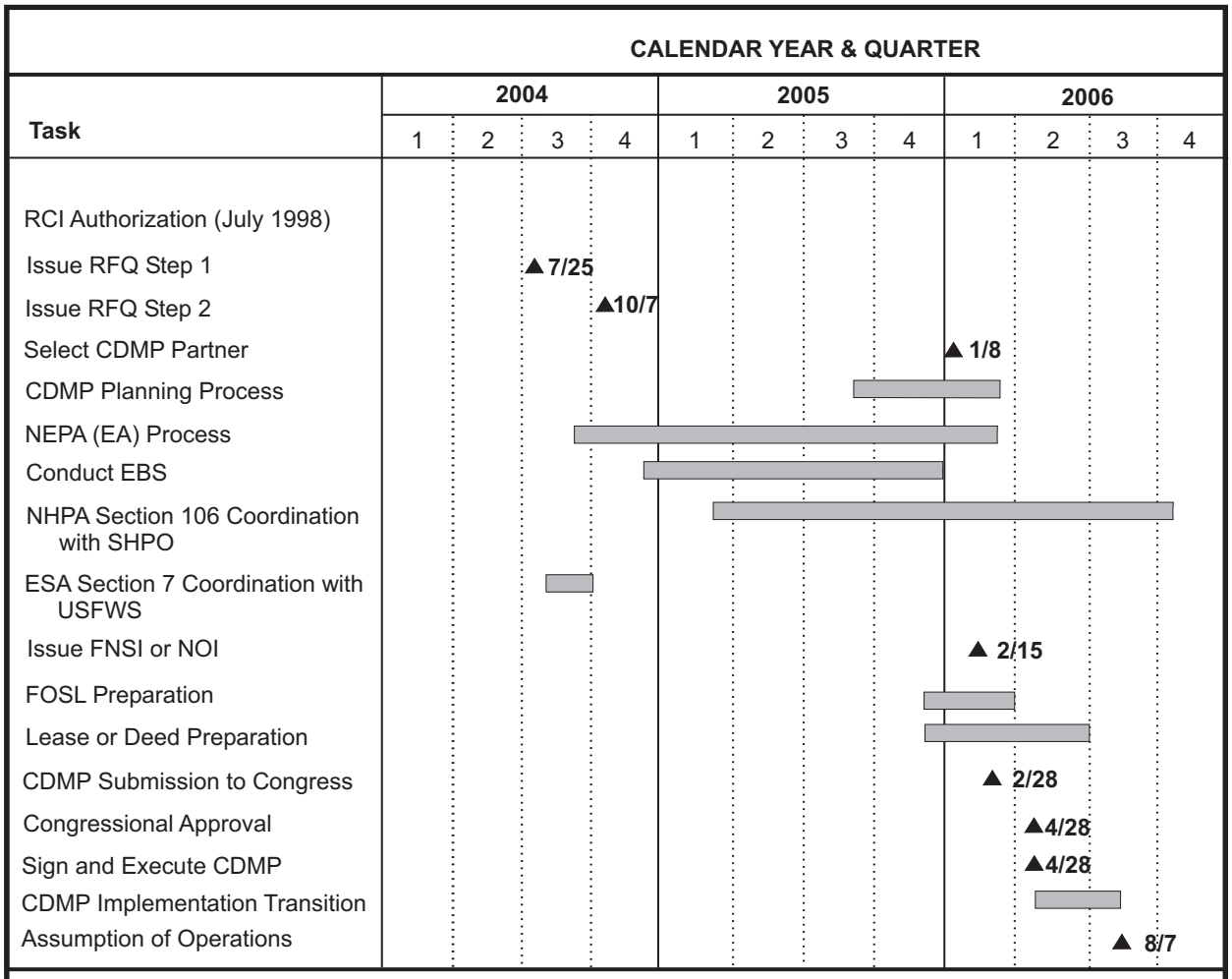
This EA identifies environmental considerations and supports decisionmaking on proposed RCI actions. Consistent with Army and other federal regulations and policies, the Army must undertake numerous other actions to achieve its objectives. Many such actions have resulted in the availability of information for use in this EA. Figure 1-2 identifies the timeline for the EA process in relationship to other actions that accompany the RCI effort.

1.4 PUBLIC INVOLVEMENT

Redstone Arsenal invites public participation in the NEPA process. Consideration of the views and information of all interested persons promotes open communication and enables better decisionmaking. All agencies, organizations, and members of the public having a potential interest in the proposed action, including minority, low-income, disadvantaged, and Native American groups, are urged to participate in the decisionmaking process.

The Army's NEPA guidance provides for public participation in the NEPA process. If the EA concludes that the proposed action would not result in significant environmental effects, Redstone Arsenal may issue a draft Finding of No Significant Impact (FNSI). Redstone Arsenal would then observe a 30-day period during which agencies and the public may submit comments on the proposed action, the EA, or the draft FNSI. Upon consideration of any comments received from the public or agencies, Redstone Arsenal may approve the FNSI and implement the proposed action. If, however, during the development of the EA it is determined that significant effects would be likely, the Army would issue a Notice of Intent to prepare an Environmental Impact Statement.

Throughout this process, the public can obtain information on the status and progress of the proposed action and the EA through the Redstone Arsenal Public Affairs Office by contacting Mr. Al Schwartz at (256) 876-4161.



RCI Project Schedule

Redstone Arsenal, Alabama

Figure 1-2

1.5 FRAMEWORK FOR ANALYSIS

The decision on whether to proceed with the proposed action rests on numerous factors, such as Redstone Arsenal's mission requirements, schedule, availability of funding, and environmental considerations. In addressing environmental considerations, Redstone Arsenal is guided by several relevant statutes (and implementing regulations) and Executive Orders that establish standards and provide guidance on environmental and natural resources management and planning. These include the Clean Air Act, Clean Water Act, Noise Control Act, Endangered Species Act, Farmland Protection Policy Act, National Historic Preservation Act, Archeological Resources Protection Act, Resource Conservation and Recovery Act, Toxic Substances Control Act, Executive Order 11988 (*Floodplain Management*), Executive Order 11990 (*Protection of Wetlands*), Executive Order 12088 (*Federal Compliance with Pollution Control Standards*), Executive Order 12898 (*Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*), and Executive Order 13045 (*Protection of Children from Environmental Health Risks and Safety Risks*). Where useful to better understanding, key provisions of these statutes and Executive Orders are described in more detail in the text of the EA.

SECTION 2.0

PROPOSED ACTION

This section presents information on the Army's RCI and Redstone Arsenal's proposed action under that initiative. Section 2.1 describes the Army RCI generally and the legislative authorities in detail, while Section 2.2 describes more specifically how the CDMP would be implemented at Redstone Arsenal. Implementation of the proposed action as described in Section 2.2 is Redstone Arsenal's preferred alternative for privatization of family housing. Other alternatives are presented in Section 3.0.

Consistent with authorities contained in the MHPI, Redstone Arsenal proposes to transfer responsibility for providing housing and ancillary supporting facilities to RAFH, a partnership consisting of the Army and Investment Builders, Inc. RAFH has developed a CDMP to implement the MHPI at Redstone Arsenal.

Development of the CDMP was an iterative process in which the CDMP was fine-tuned to meet Redstone Arsenal's housing needs for attaining affordable, quality housing and other facilities as well as minimizing or avoiding any potential environmental impacts. An excerpt of the CDMP is provided as Appendix A.

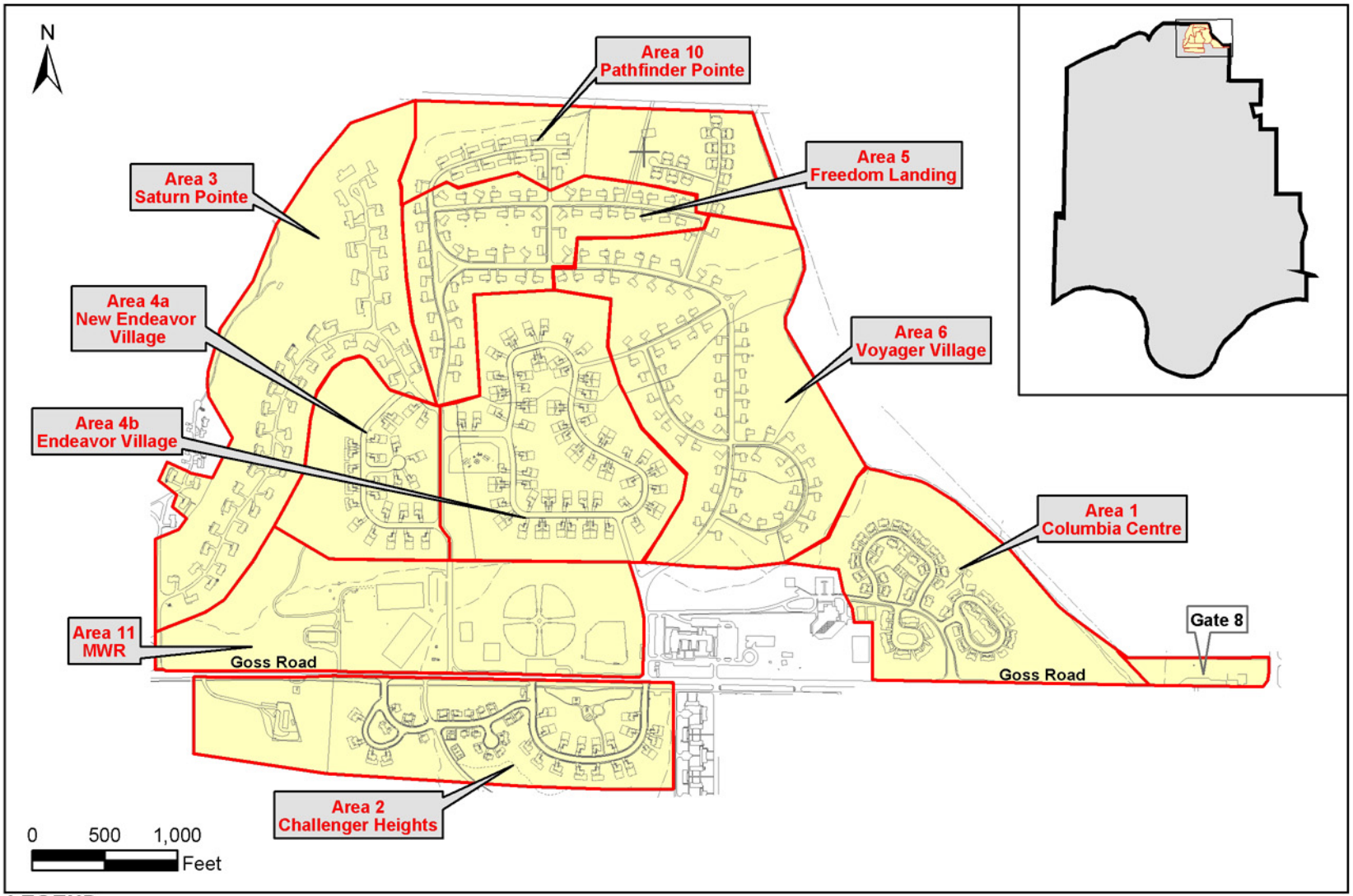
In accordance with the CDMP, Redstone Arsenal proposes to convey all of its 459 existing family housing units in seven housing areas, existing housing maintenance facilities, and other ancillary support facilities to RAFH and to provide RAFH with a 50-year land lease of approximately 430 acres with a 25-year renewal clause[2]. Figure 2-1 shows the RCI footprint within the installation's cantonment area. RAFH proposes to do major renovations on as many as 85 program units and as many as two manager homes, modernize as many as 22 program units, make improvements to as many as 118 program units, add amenities and minor improvements to as many as 120 interim units, and demolish as many as 222 units. The Initial Development Plan (IDP) would be implemented over a 3-year period beginning in October 2006, with all construction and demolitions in the IDP being completed within 3 years. Family housing units located in Area 1 and part of Area 6 (120 units total) will be retained as "interim housing units" for no longer than 17 years, being demolished no later than the 17th year of the project, or approximately October 2023. The required program units plus the allowed interim units sets the inventory at 350 units for years 1 through 17, and then reduces the inventory to the required program inventory of 230 units in 2023.

2.1 THE ARMY RESIDENTIAL COMMUNITIES INITIATIVE

2.1.1 Army RCI Procedures

The MHPI grants the Department of Defense (DoD) and the Military Services new authorities for obtaining family housing and ancillary supporting facilities. The essence of the authorities is that they comprehensively allow access to private sector financial and management resources for the improvement, construction, operation, and maintenance of family housing. The Army RCI implements the 1996 MHPI. The Army RCI is put into effect at individual installations or, in some instances, at clusters of installations that are in close proximity to each other.

[2] It is expected that all the conveyed units and ancillary structures, as well as the new units, would revert to Army ownership after 50 years.



LEGEND

RCI Footprint

Redstone Arsenal RCI Footprint

Source: Redstone Arsenal DPW, 2004.

Figure 2-1

The goal of the Army RCI, simply stated, is to provide affordable, quality housing for soldiers. Implementation of RCI projects, however, is complex. Projects typically involve large numbers of family housing units, and they represent sizable financial stakes for both the private sector developer and the Army. Moreover, project implementation is complex because of the considerable amount of planning, coordination, and oversight that must occur among diverse functions such as engineering, finance, real estate, housing management, and law, including the local community.

An RCI project normally addresses an installation's entire inventory of family housing. It might also address required ancillary supporting facilities such as community centers, neighborhood playgrounds, housing offices, and maintenance facilities. An RCI project typically has seven major steps:

1. Decision to participate in the Army RCI. The initial decision whether an installation will participate in the Army RCI rests with the Installation Commander. The Commander's decision can be influenced by many considerations, such as the general condition and availability of family housing for soldiers assigned to the installation, the number of personnel on waiting lists for family housing, the length of time required to obtain family housing, and private sector housing costs near the installation. A Commander's decision to participate in the initiative does not necessarily mean that an RCI project will ultimately occur; rather, it means that planning for the project may proceed.

2. Preliminary determination of requirements. An RCI project has five very visible components: (1) construction of new housing, (2) demolition of existing housing that is obsolete or beyond economical repair or rehabilitation, (3) renovation of housing, (4) provision of ancillary supporting facilities, and (5) operation and maintenance of the housing inventory. Upon an installation's entry into the Army RCI, information to support decisions about requirements for each component must be gathered and verified. Also, suitable locations may have to be identified for siting of new housing or ancillary supporting facilities.

To help reach these preliminary determinations, the Installation Commander initiates several studies and reports. Among these are a Report of Availability (identification of areas that might be leased to a developer/private sector entity, referred to as the "RAFH"), an environmental baseline survey (examination of potential contamination at the proposed lease site), and Department of the Army (DA) Form 337 (identification of buildings and improvements that might be conveyed to the RAFH as part of the CDMP). The Installation Commander may begin analysis of potential environmental effects at this early stage of the project's planning. Other studies that might also be initiated include a Housing Market Analysis and engineering studies pertaining to utility capacity, soil testing, and boundary delineation. For RCI projects involving housing eligible for listing in the National Register of Historic Places (NRHP), the Installation Commander should initiate consultation under Section 106 of the National Historic Preservation Act (NHPA). In all cases, the Installation Commander initiates coordination with local school districts to ensure local officials' ability to plan for and accommodate children's educational needs.

3. Two-step Request for Qualifications. The Army RCI Project Office, located within Headquarters, Department of the Army, oversees a two-step Request for Qualifications (RFQ) solicitation. Step 1 of the RFQ identifies potential development partners that are highly qualified with respect to experience, financial capability, organization (corporate level), past performance, and small business utilization (general history). Offerors meeting these requirements constitute an exclusive competitive range. In Step 2 of the RFQ process, an installation's development partner is selected based on its installation-specific preliminary concept, financial return, organizational capabilities, and small business plan.

4. Negotiation of the CDMP. Requirements for new construction, demolition, renovation, and ancillary supporting facilities, as well as future operation and maintenance of family housing, are identified and agreed upon through negotiations between an installation and its RAFH. It is during this planning and negotiating process that a variety of options or alternatives for family housing (e.g., housing sites and housing densities) and ancillary supporting facilities (e.g., types of facilities and possible locations) are considered and some are dismissed for cost, financial, or other reasons. During this time, NEPA analysis is conducted and coordinated with development of the CDMP. Through this coordination, some potential alternatives are also dismissed because of environmental concerns, while any remaining environmental issues are considered and appropriate minimization and mitigation measures are identified.

Throughout development of the CDMP, the Army evaluates the RAFH's approaches to various issues bearing on environmental stewardship. These include matters affecting potential savings with respect to energy conservation, recycling (both during demolition and construction and during later home ownership), natural landscaping and vegetative cover, and similar "smart" building and operational practices. The resulting CDMP contains all the details of the RCI project, including all work to be done, financing arrangements, and schedules.

5. Approval of the CDMP. The Installation Commander submits the negotiated CDMP through command channels to Headquarters, DA, for concurrence. The CDMP is then submitted to DoD for approval, with notification provided to the Congressional committees responsible for MHPI oversight. The approval process authorizes the installation's access to the Family Housing Improvement Fund, a revolving fund established for the MHPI, as well as the installation's use of the MHPI's authorities as set forth in the negotiated CDMP.

6. Ratification of the CDMP. Based on DoD's approval of the use of statutory authorities and the revolving fund, the installation and the RAFH sign the CDMP. Analysis of potential environmental effects in accordance with NEPA is completed prior to approving (signing) the CDMP.

7. Implementation of the CDMP. The CDMP is implemented in accordance with its terms. The approval process authorizes the installation's access to the Family Housing Improvement Fund, a revolving fund established for the MHPI, as well as the installation's use of the MHPI's authorities as set forth in the negotiated CDMP.

2.1.2 Legislative Authorities

The scope of an RCI project is determined primarily by analysis of the condition of existing housing and consideration of additional housing requirements to address the installation's deficit of affordable, quality housing. These factors drive the amount of new construction, demolition, and renovation and the number of ancillary supporting facilities needed at an installation. Negotiation of the CDMP includes selection of the appropriate legislative authorities to support fulfillment of the installation's family housing needs. These provisions give the Army and its RAFH exceptional flexibility to create successful business arrangements for the benefit of soldiers and their families. The authorities (with their U.S.C. citations) are summarized below.

- *Direct loans*. The Army may make direct loans to an eligible entity to provide funds for the acquisition or construction of housing suitable for use as military family housing. (10 U.S.C. 2873(a)(1))
- *Loan guarantees*. The Army may guarantee a loan to an eligible entity if the eligible entity uses the proceeds of the loan to acquire or construct housing units suitable for use as military family housing. (10 U.S.C. 2873(b))

- *Investment in nongovernmental entities*. The Army may make investments in nongovernmental entities carrying out projects for the acquisition or construction of housing units suitable for use as military family housing. Such an investment may include a limited partnership interest, a purchase of stock or other equity instruments, a purchase of bonds or other debt instruments, or any combination of such forms of investment. (10 U.S.C. 2875(a), (b))
- *Differential lease payments*. Pursuant to an agreement to lease military family housing, the Army may pay the lessor an amount in addition to the rental payments made by military occupants to encourage the lessor to make the housing available to military members. (10 U.S.C. 2877)
- *Conveyance or lease of existing property and facilities.* The Army may convey or lease property or facilities, including ancillary supporting facilities, to private persons for the purposes of using the proceeds to carry out activities under the initiative. (10 U.S.C. 2878)
- *Conformity with similar local housing units*. The Army will ensure that the room patterns and floor areas of military family housing units acquired or constructed under the initiative are generally comparable to the room patterns and floor areas of similar housing units in the locality concerned. Space limitations by pay grade or military family housing units provided in other legislation will not apply to housing acquired under the initiative. (10 U.S.C. 2880(a), (b))
- *Ancillary supporting facilities*. Any project for the acquisition or construction of military family housing under the initiative may include the acquisition or construction of ancillary supporting facilities. (10 U.S.C. 2881)
- *Lease payments through pay allotments*. The Army may require soldiers who lease housing acquired or constructed under the initiative to make lease payments by allotments from their pay. (10 U.S.C. 2882(c))

2.2 IMPLEMENTATION OF THE PROPOSED ACTION

The proposed CDMP would include a number of actions to be undertaken by Redstone Arsenal and RAFH. This section provides an overview of the CDMP. An excerpt of the CDMP is provided as Appendix A. Under the CDMP, development will respect and respond to the existing natural and built environment in order to minimize impact and to capitalize on the value of existing conditions. Planning responds to the following environmental principles:

- Housing areas will be designed to respect the existing natural systems of topography, vegetation, and drainage.
- Developed areas will be designed to minimize ground disturbance, aboveground utilities, and drainage.
- Existing landscape will be preserved in all possible situations.
- The landscape will be populated largely with native plant materials.
- A water-management system will be designed to handle both the quantity and quality of storm water runoff.
- Community design will reduce dependency on the car.
- An open-space network will be used to link larger spaces, corridors, and fragments with a system of pedestrian/bike trails.

- The sense of community will be heightened with improved and linked open spaces, strategic tree locations, trail systems, activity areas, and street layouts that enhance the quality of outdoor life.
- Existing built and non-built landscapes will be accessed and integrated with the new.

2.2.1 Community Development and Management Plan Provisions

2.2.1.1 Lease of land

Redstone Arsenal would grant RAFH a lease of the approximately 370 acres now used for family housing and family housing support. Redstone Arsenal also would grant a 50-year lease for parcels in additional areas totaling approximately 60 acres for siting of ancillary supporting facilities to be constructed, operated, and maintained by RAFH. Lease of these parcels would be subject to several conditions imposed by the Army. The lease would be subject to all existing easements or those subsequently granted, as well as established access routes for roadways and utilities located, or to be located, on the premises. The lease would include clauses

- Prohibiting RAFH from storing hazardous wastes (above those quantities generated in routine operations and immediately disposed of) or taking any actions that would cause irreparable injury to the land. RAFH would be required to comply with all federal, state, interstate, or local applicable laws, regulations, conditions, or instructions affecting its activities. The Army also would include clauses in the lease permitting the Army's periodic inspection of the property to ensure its safe condition and its proper use in accordance with the terms of the lease.
- Prohibiting discharge of waste or effluent from the premises in such a manner that the discharge would contaminate streams or other bodies of water or otherwise become a public nuisance.
- Prohibiting removal or disturbance of, or causing or permitting to be removed or disturbed, any historical, archeological, architectural or other cultural artifacts, relics, remains, or objects of antiquity. In the event such items would be discovered, RAFH would be required to notify the Installation Commander or his designated representative immediately and protect the site and the material from further disturbance until the Installation Commander or designated representative gives clearance to proceed.
- Requiring maintenance of all soil and water conservation structures and the taking of appropriate measures to prevent or control soil erosion within the premises. These measures would be addressed in permits (e.g., Clean Water Act Section 404 permits) and in Storm Water Pollution Prevention Plans (SWPPPs).
- Prohibiting cutting timber; conducting mining operations; removing sand, gravel, or kindred substances from the ground; burying waste of any kind; or in any manner substantially changing the contour or condition of the premises except as authorized through permits or by the Installation Commander or his designated representative.
- Prohibiting RAFH from installing water wells and the withdrawal and use of groundwater for any purpose.

2.2.1.2 Existing family housing areas

Redstone Arsenal's 459 units of family housing are in seven housing areas in the northern portion of the installation. The housing areas are known as Columbia Centre (Area 1), Challenger Heights (Area 2), Saturn Pointe (Area 3), New Endeavor Village and Endeavor Village (Areas 4a and 4b,

respectively), Freedom Landing (Area 5), Voyager Village (Area 6), and Pathfinder Pointe (Area 10). Housing in these areas consists of multiplexes, duplexes, and single-family dwellings. The following tables provide information on Redstone Arsenal's housing areas: Table 2-1 shows the housing stock by year of construction and bedroom count, Table 2-2 shows the distribution of family housing by area and bedroom count, and Table 2-3 shows the distribution of family housing by grade and bedroom count.

Table 2-1
Housing Stock by Year of Construction and Bedroom Count

Constructed	2-BR	3-BR	4-BR	5-BR	Total
1957	0	20	28	0	48
1959	0	115	7	0	122
1972	0	0	48	0	48
1995	66	31	19	4	120
2000	0	22	3	0	25
2002	0	21	17	2	40
2003	0	28	26	2	56
Totals	**66**	**237**	**148**	**8**	**459**

Note: BR = bedroom

Table 2-2
Distribution of Family Housing by Area and Bedroom Count

Housing Area	2-BR	3-BR	4-BR	5-BR	Total
Columbia Centre	60	23	13	0	96
Challenger Heights	6	18	18	4	46
Saturn Pointe	0	21	30	0	51
Endeavor Village and New Endeavor Village	0	60	32	4	96
Freedom Landing	0	49	7	0	56
Voyager Village	0	66	0	0	66
Pathfinder Pointe	0	0	48	0	48
Totals	**66**	**237**	**148**	**8**	**459**

Note: BR = bedroom

Table 2-3
Distribution of Family Housing by Grade and Bedroom Count

Grade	2-BR	3-BR	4-BR	5-BR	Total
Officers Quarters	0	57	52	0	**109**
Enlisted Quarters	66	180	96	8	**350**

Note: BR = bedroom

2.2.1.3 Development strategy

In developing the CDMP, Redstone Arsenal and RAFH considered several options for implementing the proposed action. Implementation of the CDMP would require that RAFH

operate and maintain all family housing for a period of 50 years (with an optional 25-year extension), as well as construct, operate, and maintain the ancillary supporting facilities. The development plan has a variety of options for family housing units, including the following:

- *Technical revitalization:* Replace or repair various housing components to upgrade units to standard (e.g., replace dishwasher, replace roof, replace light fixtures, repair driveway and sidewalk).
- *Functional replanning:* Add, modify, or improve the floor plan or structure to enhance livability (e.g., convert two two-bedroom units into one four-bedroom unit).
- *Redesignation:* Modify the number of bedrooms in a housing unit without construction (e.g., redesignate a 3-bedroom home as a 2-bedroom home with a family room).
- *Demolition/remove:* Completely remove housing unit without replacing.
- *Demolition/replacement:* Completely remove housing unit and replace with alternative housing unit.
- *Infill/existing:* Build replacement-housing unit within an existing housing area.
- *Replacement/undeveloped land:* Build replacement-housing unit on an unoccupied site.
- *Replacement/existing:* Build replacement-housing unit on an existing/occupied-housing site.

Table 2-4 summarizes the actions that RAFH would take under the CDMP to improve Redstone Arsenal's family housing. As a result of the actions shown in the table, the installation's family housing inventory would be reduced from 459 units to approximately 230 units.

Table 2-4
Housing Actions Under the CDMP

Housing Area	Housing Units	Actions
Area 1: Columbia Centre	96	Retain all 96 interim units for 17 years (then demolish)
Area 2: Challenger Heights	46	Retain all units; minor renovations
Area 3: Saturn Pointe	51	Demolish as many as 36 units, renovate as many as 5 units
Area 4a: New Endeavor Village, and Area 4b: Endeavor Village	96	Retain all units
Area 5: Freedom Landing	56	Demolish as many as 13 units, renovate as many as 43 units
Area 6: Voyager Village	66	Demolish as many as 16 units, retain as many as 26 interim units for 17 years (then demolish), renovate as many as 24 units
Areas 10a and 10b: Pathfinder Pointe	48	Area 10a: Demolish all 30 units Area 10b: Demolish as many as 5 units, renovate as many as 13 units

2.2.1.4 Conveyance

All existing family housing units would be conveyed to RAFH. The Army would convey this property with encumbrances, notices, and requirements obligating RAFH to certain actions. As

appropriate to each structure or group of structures, the deed would identify the presence of asbestos-containing materials, lead-based paint, or radon. The Army would also identify any easements and rights-of-way that might affect use of the conveyed property. These encumbrances would be in the form of covenants in the deed and would be binding on the transferee, as well as any subsequent successors or assigns.

2.2.1.5 Barrier-free design

New family housing and ancillary supporting facilities must adhere to the *Uniform Federal Accessibility Standards* and the *Americans with Disabilities Act Accessibility Guidelines* promulgated by the Access Board (formerly known as the Architectural and Transportation Barriers Compliance Board) pursuant to the Architectural Barriers Act of 1968, Rehabilitation Act of 1973, and Americans with Disabilities Act of 1990. These standards require that at least 5 percent of new family housing be designed and built to be accessible, or easily modifiable for access, by persons with physical disabilities.

2.2.1.6 Construction standards

Construction standards to be applied to family housing reflect consideration of both military specifications and local community building codes.

2.2.1.7 Operation and maintenance

RAFH would operate and maintain for 50 years all existing and new family housing units and ancillary supporting facilities, including associated parking lots and sidewalks, in accordance with the quality standards established in the CDMP. At Redstone Arsenal's option, the installation may extend the period of operation and maintenance and the leases of land supporting family housing for an additional 25 years.

2.2.1.8 Rental rates and payments

The rental rate to be paid by any soldier would not exceed his or her Basic Allowance for Housing (BAH). Redstone Arsenal would continue to categorize family housing by grade group (e.g., junior noncommissioned officer [NCO], senior NCO, company grade officer).

2.2.1.9 Occupancy guarantee

Redstone Arsenal would not guarantee for RAFH the level of occupancy of the housing units. Under special circumstances such as large-scale, long-term deployments, RAFH could rent vacant family housing units to tenants other than service members with dependents in accordance with Table 3-3 ("Priority of assignment for family housing") in Army Regulation (AR) 210-50 (*Housing Management*) at rental rates no lower than those a soldier would be charged. RAFH's basic lease agreement in such case must be approved by the Installation Commander.

2.2.1.10 Regulatory controls

It is the intent of the development plan to adopt the International One and Two Family Dwelling Code, 1998 edition, by the International Code Council, Inc., with standardized requirements for building, plumbing, mechanical, and electrical by incorporation of a compilation of data from the following national model codes: Uniform Building Code; Standard Building Code; National Building Code of the Building Officials and Code Administrators International, Inc. (BOCA); Standard Plumbing Code; International Building Code; BOCA National Plumbing Code; Uniform Mechanical Code; Standard Mechanical Code; Standard Gas Code; BOCA National Mechanical Code; Code for the Installation of Heat-Producing Appliances; National Electrical

Code; applicable Alabama state codes and regulations; and applicable federal codes and regulations.

2.2.1.11 Utilities

The Army and RAFH have developed a utility program that promotes energy conservation and reduced utility consumption. Under this program, RAFH would be responsible for all costs of utilities provided to common areas of the project and all vacant units during the entire project period. Furthermore, the RAFH would be responsible for all utilities in occupied housing units covered by the project until the units were renovated or replaced, utility meters (electric, gas, and/or oil) were installed, and a 12-month consumption record was established. When these three conditions were met in an entire housing area and appropriate notice was provided to the service member occupants, the service members would become responsible for the cost of utilities (electric, gas, and/or oil) for their residences.

After consumption records were established, an average utility consumption cost would be determined for each housing unit type. The service member would then receive this amount from his or her BAH and be responsible for paying utilities. If the utility costs were to exceed the service member's calculated utility allowance, the service member would be responsible for paying the additional amount from basic pay. If the utility bill was less than the calculated allowance, the service member would pay the actual monthly utility cost and retain any excess funds.

2.2.1.12 Police and fire protection

Redstone Arsenal would provide police and fire protection to RAFH on a cost-reimbursable basis.

2.2.1.13 Jurisdiction

Legislative jurisdiction at Redstone Arsenal is partial. The term "partial legislative jurisdiction" is applied when the federal government has been granted, for exercise by it over an area in a state, certain of the state's authority, but where the state concerned has reserved to itself the right to exercise, by itself or concurrently with the United States, other authority constituting more than merely the right to serve civil and criminal process in the area attributable to actions outside the area.[3] Implementation of the Army RCI would not change existing legislative jurisdiction.

2.2.1.14 Implementation commencement

Assuming execution of the CDMP by Redstone Arsenal and RAFH before the end of April 2006, implementation of the CDMP would begin in August 2006.

2.2.2 Siting of New Housing

During the period the CDMP is in effect, RAFH would be responsible for providing affordable, quality housing and ancillary supporting facilities to soldiers and their families through a combination of replacement of and improvement to existing family housing units. As required, RAFH would also be required to provide new or additional housing. To the extent possible, the following siting criteria would be considered in establishing the footprint for any new or additional RCI family housing.

[3] Definitions and characteristics of jurisdiction are provided in AR 405-20, *Federal Legislative Jurisdiction*.

2.2.2.1 Proximity to existing housing

New family housing and ancillary supporting facilities would be located near existing family housing. From a land use pattern perspective, this approach allows for maintaining consistency in adjacent land uses in larger general areas. It also results in residents being close to existing supporting facilities such as schools, community clubs, the post exchange (PX), the commissary, and auto service stations. Such proximity helps create a sense of "small town" neighborhoods where principal shopping destinations are nearby. Locating new neighborhoods close to existing ones helps to reduce development costs by enabling use of existing utility corridors and other infrastructure. Finally, keeping family housing in or near a generally developed portion of the installation avoids opening newer, more distant areas. Risks of potential effects to ecological systems (e.g., wildlife disturbance, habitat fragmentation) are thus decreased.

2.2.2.2 Sufficient size

Lack of sufficient acreage for proposed housing could adversely affect an otherwise pleasing atmosphere by creating too high a building density. Allocation of a sufficient amount of property would result in a density that strikes an appropriate balance between the residents' desire for space and an appropriate use of land resources.

2.2.2.3 Physical features

Any site for family housing must not be located on steep terrain, in areas heavily incised by watercourses, or within any stream buffers, wetland buffers, or floodplains.

2.2.2.4 Compatible land use

Family housing parcels must not result in creation of incompatible land uses (e.g., within airfield runway accident potential zones or clear zones, within or near high-noise areas, on contaminated properties, or adjacent to off-post industrial property).

2.2.2.5 Minimal loss of natural, ecological, and cultural resources

Siting of family housing must avoid loss of natural, ecological, and cultural resources such as wetlands, listed or sensitive species or their habitat, wildlife species' travel corridors, archeological sites, and structures eligible for the NRHP.

2.2.2.6 Military security

Parcels must be located so as not to enable or encourage residents to interfere with military security requirements or to pose risk of breach of military security. Housing areas should not be located near sites supporting activities to which access is controlled for security reasons.

2.2.2.7 Operational safety

Family housing parcels should be located away from operational areas to avoid potential safety risks to residents. In addition, family housing should not be located so that residents would be required to travel past or through testing or training areas while transiting to off-base locations.

SECTION 3.0

ALTERNATIVES

Redstone Arsenal has identified four alternatives for its proposed action, as well as a no action alternative. These alternatives are presented below.

3.1 THE PREFERRED ALTERNATIVE

Implementation of the proposed action, as described in Section 2.2, is Redstone Arsenal's preferred alternative. Use of various MHPI authorities, proposed for and identified in the CDMP put forth by RAFH and negotiated by Redstone Arsenal, would achieve the purpose of and need for the proposed action as described in Section 1.2. Accordingly, this alternative is evaluated in detail in Section 4.0 of this document.

3.2 THE PARTIAL PRIVATIZATION ALTERNATIVE

Under this alternative, Redstone Arsenal would subject only a portion of the installation's family housing to the RCI. Family housing in good condition (not needing demolition or renovation) would remain subject to Army management for maintenance and operational control.

Privatization of only a portion of Redstone Arsenal's family housing inventory would have three substantial drawbacks. First, the condition of the family housing retained by the Army would change over time, resulting in a need for its renovation or replacement. Failure to include the entire inventory of housing in the RCI would only delay action to provide adequate housing for soldiers and their dependents. Second, two management regimes (the Army's and the RAFH's) would not be as cost-efficient as one. From a RAFH's perspective, maximum potential cash flow is also important to support development and operation of ancillary supporting facilities desired by an installation, activities that traditionally do not provide independent sources of revenue for their sustainment. Finally, partial privatization would not fully meet the Army's purpose of and need for the proposed action. Together, these factors render consideration of partial privatization at Redstone Arsenal not feasible, and therefore such an alternative is not evaluated in detail in this EA.

3.3 THE PRIVATE SECTOR RELIANCE ALTERNATIVE

Under this alternative, Redstone Arsenal would rely solely on the private sector to meet the housing needs of personnel assigned to the installation. The installation would terminate family housing programs, dispose of existing family housing units, and convert the land now supporting housing areas to other uses.

The alternative is premised, in part, on the view that competitive marketplace forces would lead to the creation of sufficient affordable, quality family housing. Data vary, but in general experience shows that soldiers and their families living off-post must cover between 15 and 20 percent of their costs out-of-pocket. Moreover, there are several intangible benefits to soldiers and their families living on-post. These include camaraderie and *esprit de corps* among the military personnel, a sense of "family" among dependents (especially during soldiers' deployments), proximity to the workplace (thereby avoiding lengthy commutes), and soldiers' comfort level in knowing that their dependents are residing in a safe community while they are deployed or serving on temporary duty at a distant location.

As a practical matter, termination of Redstone Arsenal family housing would prove difficult. If on-post housing were to be terminated over a period of years, in the absence of maintenance funding, the existing housing would become unsuitable due to age or necessity of repairs. Residents could then find themselves living in blighted and partially abandoned neighborhoods. If on-post housing were to be terminated at once, it is unlikely the private sector could provide the requisite amount of affordable, quality housing, as well as schools, shopping, roads, and other support amenities on short notice.

Renovation of many of the family housing units at Redstone Arsenal is economically sound. Termination of family housing programs would involve abandonment of immense investments in those facilities. The various consequences of reliance on the private sector and the management difficulties of effecting termination of family housing on-post would prove challenging. In light of the aggregate value of family housing units amenable to renovation, termination of a family housing construction and maintenance program would gravely contravene the fiscal responsibilities the Congress expects of the Army. For these reasons, this alternative is not reasonable and is not further evaluated in this EA.

3.4 THE LEASING ALTERNATIVE

Statutory authorities exist for Redstone Arsenal to ensure availability of adequate, affordable housing through use of long-term leases of housing for military family use. Key aspects of the two laws providing these authorities are summarized below.

- *Long-term leasing of military family housing to be constructed*. Family housing obtained through use of this authority, which appears at 10 U.S.C. 2835, is most often referred to as "Section 801 Housing." Under this authority, the Army may, through competitive contract procedures, have a developer build or renovate (to residential use) family housing units near an installation. Housing units under this authority must meet DoD specifications. The Army may then lease the units for use as family housing for a period of not more than 20 years. At the end of the lease term, the Army has the option to purchase the housing units from the private developer.
- *Military housing rental guarantee program.* Family housing obtained through use of this authority, which appears at 10 U.S.C. 2836, is most often referred to as "Section 802 Housing." Under this authority, the Army may award a competitive contract to a private developer or a state or local housing authority to construct or rehabilitate housing on or near an installation having a shortage of housing for personnel with or without accompanying dependents. Under the contract, the Army guarantees occupancy levels of the housing units, at rental rates comparable to those for similar units in the same general market. Housing units under this authority must comply with DoD specifications or, at the discretion of the Service secretary, local building codes. A rental guarantee agreement may not exceed 25 years in duration; it may be renewed only for housing that is located on government-owned land. The agreement may provide that utilities, trash collection, snow removal, and entomological services be furnished by the Army at no cost to the occupant to the same extent such services are provided to occupants of base housing.

There has been only limited experience with either of the foregoing authorities. An important drawback affecting both programs concerns what is known as budget "scoring," the method of accounting for federal government obligations as required by the Budget Enforcement Act of 1990. Scoring ensures that all government obligations are accounted for when long-term liability is incurred (i.e., during the first year of a project). Scoring guidelines issued by the federal Office of Management and Budget require that a project must be fully funded with sufficient budget

authority in its first year to cover the government's long-term commitment. In other words, all potential costs associated with long-term leasing or rental guarantee programs must be recognized in the first year, and they must be considered as part of the Army's total obligational authority (the total monies appropriated by Congress for use by the Army in a given year). For some privatization projects, such as military leased housing, the Army's obligations for scoring purposes amount to the net present value of the total rent under the lease. These amounts can be nearly as great as the sums required under traditional military construction financing for Army-initiated construction of similar facilities.

The Section 801 housing program and Section 802 rental guarantee program only partially address the Army's purpose and need for the proposed action. Due to the scoring guidelines, the Army would obtain very little or no leverage benefit.

Enactment of new authorities in the MHPI suggests Congress's recognition that Section 801's and Section 802's drawbacks outweigh their potential benefits to the Army. Although use of either or both of the Section 801 and Section 802 authorities would be possible, their use would not be reasonable when compared to the better flexibility and economic advantages of the new authorities offered by the RCI to the Army and to the soldiers' families. Accordingly, the off-post leasing alternative is not further evaluated in this EA.

3.5 THE NO ACTION ALTERNATIVE

Inclusion of the no action alternative is prescribed by CEQ regulations. The no action alternative serves as a baseline against which the impacts of the proposed action and alternatives can be evaluated.

Under the no action alternative, Redstone Arsenal would not implement the proposed action but would continue to provide for the family housing needs of its personnel through use of traditional military maintenance and construction procedures. Redstone Arsenal would continue to obtain funding for family housing through the congressional authorization and appropriations process. Based on historical trends, it is assumed that the amount of congressional funding for family housing would not change and that the housing maintenance backlog would continue to increase. Any major changes to or construction of new housing would require that appropriate NEPA analyses be completed before implementing such actions.

SECTION 4.0
AFFECTED ENVIRONMENT AND CONSEQUENCES

4.1 LAND USE

4.1.1 Affected Environment

4.1.1.1 Regional Setting

Redstone Arsenal occupies 38,100 acres along the Tennessee River in Madison County, Alabama (Tetra Tech, 1995). The river bounds the installation to the south, and the city of Huntsville borders it to the northeast. The installation is in the Appalachian Highlands Physiographic Province (USGS and NPS, 2003). The regional climate is characterized as humid subtropical, with hot, humid summers and cool winters. The average daily temperatures are 80 degrees Fahrenheit (^{o}F) during the summer and 40 ^{o}F in the winter. Average annual precipitation is approximately 55 inches, primarily as rain. Precipitation is generally highest in March and lowest in October. Violent storms occur most frequently in the spring, and tornadoes have been recorded over the Arsenal (Redstone Arsenal, 2001; Tetra Tech, 1995). Redstone Arsenal's topography is gently rolling hills, with an elevation of about 650 feet above mean sea level (msl) in the vicinity of the RCI footprint. Elevations of up to 1,240 feet msl occur on Weeden and Madkin mountains just south of the RCI footprint (SMC and IERA, 2000; USGS, 1991).

4.1.1.2 Installation Land Use

Installation-wide land use. Land use on the installation is of 10 general types—family housing, troop housing, community facilities, recreation, administration, training facilities, industrial facilities (operational, production, and maintenance facilities), research and development facilities, storage areas, and testing areas and associated safety fans (Figure 4-1). Testing areas for missile, rocket, and laser research occupy about 14,700 acres (39 percent of the installation) (generally in the southern and western portions of the installation). Testing is the largest land use on the installation. Training at Redstone Arsenal includes field training exercises and munitions training; training areas cover about 6,700 acres (18 percent) of the installation. The Weeden and Madkin mountain areas are designated for outdoor training (Parsons HBA, 1999). The majority of the remaining land uses are in the cantonment area in the northeast portion of the installation. Table 4-1 lists land uses and acreages for the installation. The RCI footprint encompasses approximately 430 acres in the northern portion of the cantonment area, along the installation's northeastern boundary. Land uses surrounding the RCI footprint include community services, recreation areas, and training facilities.

Other land uses on Redstone Arsenal include a 1,864-acre parcel licensed to NASA's Marshall Space Flight Center. In addition, two parcels in the southern portion of the installation are owned by other federal agencies but permitted for use by Redstone Arsenal—5,658 acres of the Wheeler National Wildlife Refuge owned by the U.S. Fish and Wildlife Service and 1,250 acres of Tennessee Valley Authority (TVA) land (Parsons HBA, 1999). About 3,800 acres of Redstone Arsenal are available for agricultural leases; the closest lease unit to the RCI footprint is number 114, about 0.75 mile southwest of the RCI footprint (Redstone Arsenal, 2001).

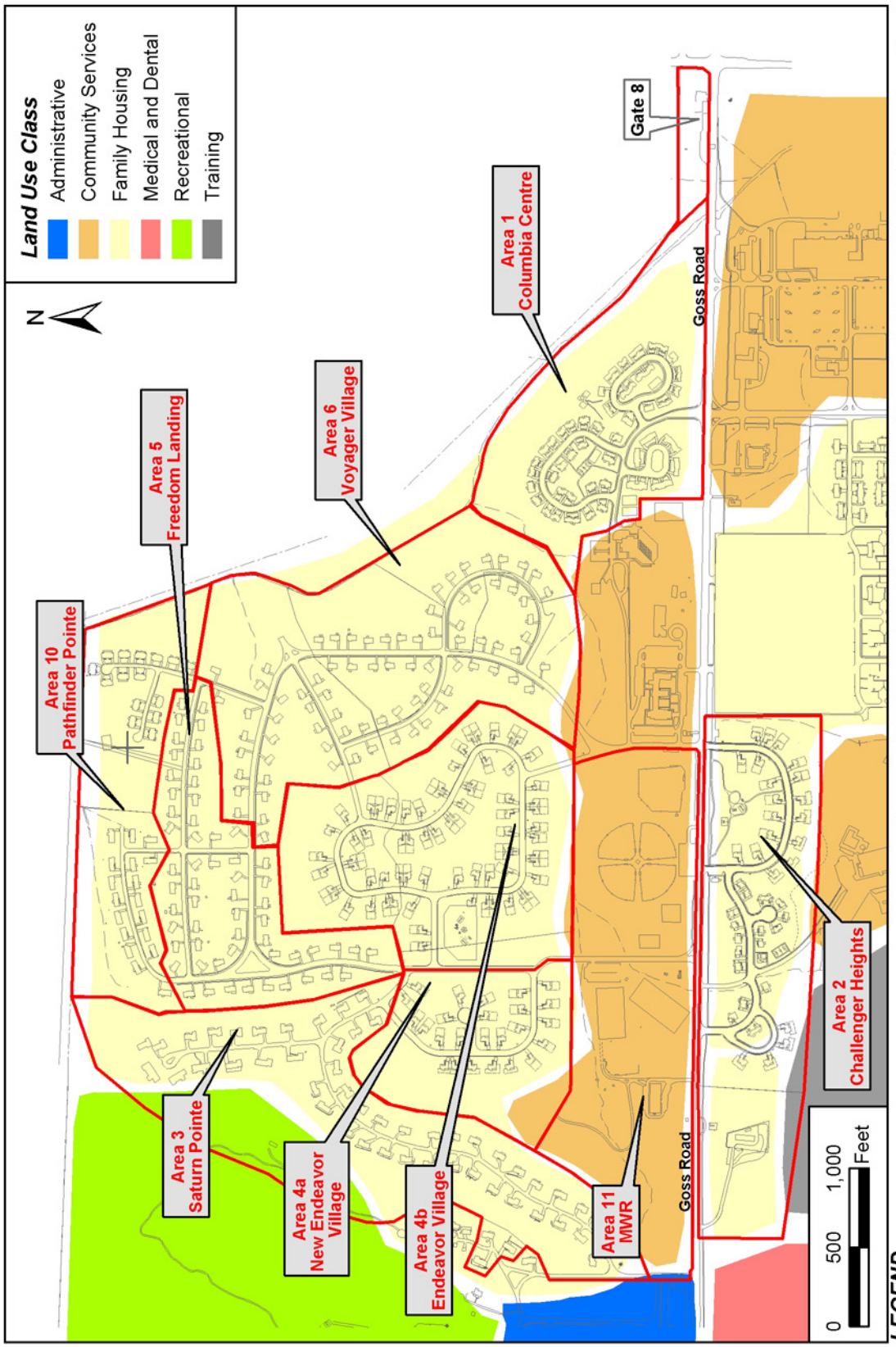

Land Use Class
Administrative
Community Services
Family Housing
Medical and Dental
Recreational
Training
N
Area 10 Pathfinder Pointe
Area 5 Freedom Landing
Area 6 Voyager Village
Area 1 Columbia Centre
Gate 8
Goss Road
Area 3 Saturn Pointe
Area 4a New Endeavor Village
Area 4b Endeavor Village
Area 11 MWR
Goss Road
Area 2 Challenger Heights
0 500 1,000 Feet
LEGEND
RCI Footprint
Buildings
Land Use in the Vicinity of the RCI Footprint
Source: Redstone Arsenal DPW, 2004.

Figure 4-1

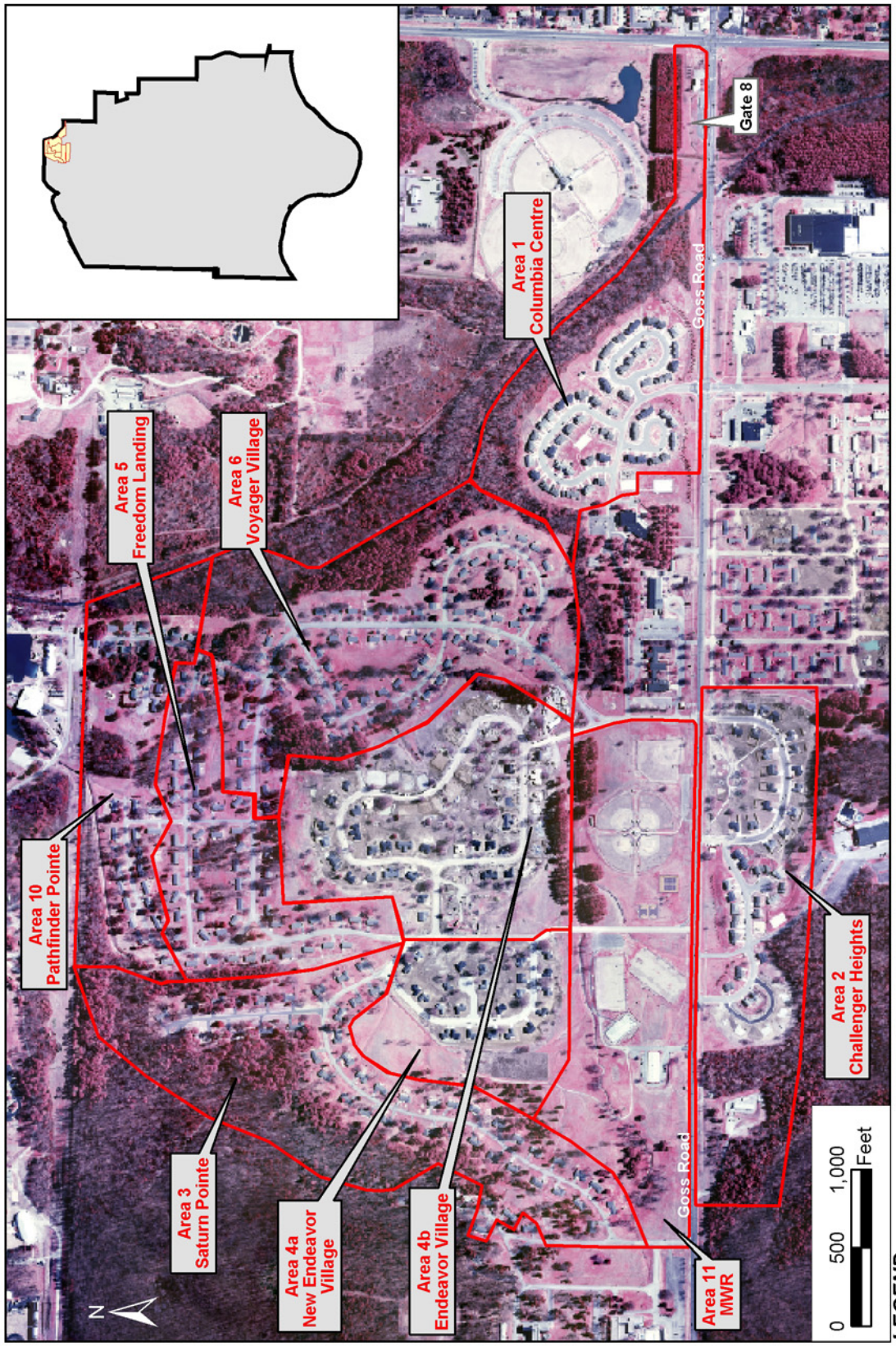
Table 4-1
Land Uses on Redstone Arsenal

Land Use	Approximate Acreage	Percentage
Administration	1,285	3.4
Community facilities	270	0.7
Family housing	451	1.2
Industrial facilities	5,777	15.2
Recreation	2,183	5.7
Research and development	424	1.1
Storage	2,350	6.2
Testing areas	14,718	38.6
Training facilities	6,669	17.5
Troop housing	40	0.1
NASA	1,864	4.9
Other	2,069	5.4
Total	**38,100**	**100.0**

Source: Parsons HBA, 1999; Redstone Arsenal DPW, 2004; Wu, 2004; Phillips, 2005.

Existing family housing areas. The family housing on Redstone Arsenal is in seven neighborhoods (Figure 4-2 and Table 4-2). Seven neighborhoods north of Goss Road occupy 384 acres of the RCI footprint, and one neighborhood (Challenger Heights) south of Goss Road covers 68 acres. The housing units in three former housing areas south of Goss Road were recently moved off-site, and the cleared parcels are to be preserved as open space. Table 4-2 lists the housing areas and density of units. Redstone Arsenal has an overall housing density of about one dwelling unit per acre. The Columbia Centre housing area has the highest residential housing density at 2.1 units per acre, which is generally considered medium-low-intensity residential development (2 to 6 housing units per acre). All other housing areas on Redstone Arsenal are low-intensity (less than 2 units per acre) residential development.

The existing housing areas are surrounded by community facilities, recreational areas, and training areas. A land use analysis (Parsons HBA, 1999) determined that about 4,600 acres of buildable land is available on the installation, although at the time of the study none of the land in areas designated for housing land use or immediately surrounding the housing areas was available for further development for housing. As stated above, however, three housing areas south of Goss Road were recently cleared of housing units. Those areas are currently planned for open space, but they could be available for new housing development if the need were to arise.



Source: Redstone Arsenal DPW, 2003.

Figure 4-2

Table 4-2
Housing Area Acreage and Density

Housing Area	Acres	Density (units/acre)
1: Columbia Centre	47	2.1
2: Challenger Heights	68	0.7
3: Saturn Pointe	65	0.8
4a: New Endeavor Village 4b: Endeavor Village	81	1.2
5: Freedom Landing	33	1.7
6: Voyager Village	70	0.9
10: Pathfinder Pointe	33	1.4
11: MWR area	56	-
Total	**453**	**1.0**

Community services and recreation areas that support residents in the vicinity of the RCI footprint are along Goss Road. Recreational fields (baseball, tennis, basketball, soccer) are located in the Morale, Welfare, and Recreation (MWR) portion of the RCI footprint. Other services and recreation facilities, such as the Fox Army Medical Clinic and the Redstone Arsenal golf course, are outside the footprint.

Land Use Compatibility. Family housing areas at Redstone Arsenal are surrounded by compatible land uses, primarily open space (or wooded areas) and community facility land uses.

Leases. Easements for utilities or other infrastructure, such as water mains and electrical power lines allow for utility service providers to supply utilities to the housing areas. The leases are considered and respected in planning and development under the proposed action.

Future Development on the Installation. Several construction projects are proposed on Redstone Arsenal that are in the vicinity of the RCI footprint and would provide community services to Redstone Arsenal residents. These projects must be taken into consideration when locating new housing sites. They include a School Age Services (SAS) child care facility, a physical fitness center addition, an outdoor recreation complex, a hotel/conference facility, major renovations to the PX and Commissary complex, an additional 9 holes on the golf course, centering all University system schooling in a central area outside Gate 9 through Enhanced Use Leasing, and construction of the southern bypass highway (IMSE-RED-PWM summary, 2005; Jones Lang Lasalle, 2002; RASA-DEM, 2001). Brief descriptions of the projects are below.

- The City of Huntsville has offered to construct up to seven General Officer Quarters homes on Wadsworth Drive as gifts to the Army. Subject to Department of the Army acceptance of the gift, construction should begin around February 2006 and be completed by October 2006. These homes would be located in the northern portion of Housing Area 3.
- Hotel/Conference Facility (Proposed). A hotel, with up to 250 rooms, is proposed to be located adjacent to the RCI footprint southwest of the Saturn Pointe housing area (Area 3).
- SAS Child Care Facility (FY 2006). An SAS facility will be constructed near the existing child development center and youth center. The facility will have capacity for 190 children and will be located adjacent to the RCI footprint southwest of the Columbia Centre housing area.

- Physical Fitness Center (Proposed). A 50,000-square-foot fitness center, which would complement the existing Redstone Fitness Center and replace Pagano Gym, would include a swimming pool, indoor running track, and aerobic and fitness facilities.
- Outdoor Recreation Complex (FY 2006). A recreation complex with a campground and recreational cabins is proposed in the vicinity of Vincent Drive, across from the existing PX and Commissary complex.
- Golf Course (FY 2007). Nine 9 holes will be added to the existing golf course facilities near Gate 9.
- Southern Bypass (Proposed). Construction of the Southern Bypass highway is proposed to replace the existing Toftoy Thruway. It would extend off the east-central portion of the installation to connect with U.S. Highway 231.

4.1.1.3 Surrounding Land Use

Off-Post Land Use. The off-post area surrounding the Redstone Arsenal RCI footprint to the north and east consists of dense residential areas and industrial and commercial areas. The U.S. Space and Rocket Center, Madison Pike Elementary School, and commercial areas are adjacent to the RCI footprint and installation boundary, along east-west-trending Bob Wallace Avenue (Redstone Arsenal, 2001; SMC and IERA, 2000). Interstate 565, which runs northeast-southwest, is north of Bob Wallace Avenue (Figure 4-1).

Future Development in the Region. Off-post, both commercial and residential development are expected to continue to increase. Zoning regulations within the city of Huntsville, which indicate long-term development patterns around the installation, are consistent with existing patterns and provide room for future growth (SMC and IERA, 2000). No large-scale development projects planned in the vicinity of Redstone Arsenal have been identified.

4.1.2 Consequences

4.1.2.1 Proposed Action

Long-term minor beneficial effects on installation land use would be expected. No land use incompatibilities would be expected because no housing construction is planned for areas outside existing housing areas. RAFH would increase buffer space around the family housing by eliminating Housing Area 1 and the easternmost portions of Area 6. This would be beneficial by helping to separate housing from other land uses, as well as help interconnect the neighborhoods to create more cohesive communities.

Adherence to the optimal land use plans outlined in the *Redstone Arsenal Real Property Master Plan Land Use Analysis* (Parsons HBA, 1999) when siting new construction planned in the CDMP would help to ensure that land use incompatibilities are avoided or minimized to the extent possible.

No effects on surrounding land use would be expected.

4.1.2.2 No Action Alternative

No effects would be expected under the no action alternative. Residential and surrounding areas would be maintained as they currently are, with no land use changes.

4.2 AESTHETICS AND VISUAL RESOURCES

4.2.1 Affected Environment

Aesthetics and visual resources are the natural and man-made features on the installation landscape. They include cultural and historic landmarks, landforms of particular beauty or

significance, water surfaces, and vegetation. Together these features form the overall impression that a visitor or resident receives of the area or its landscape.

The Redstone Arsenal cantonment area is built on relatively level to slightly rolling topography with low-lying areas scattered throughout, separated by the steep Weeden, Madkin, and Ward mountains. Buildings vary in size and style, having been constructed from the 1940s to the present and vary in the extent to which they have been maintained. Open grassy areas, along with some ornamental trees and landscaping around the structures, separate the buildings.

Within the RCI footprint there is a mixture of open and treed vistas. Mowed common areas, fenced yards, and some landscaping around homes generally characterize the housing areas. Groves of mature hardwoods are scattered throughout the housing areas. The views surrounding the RCI footprint area vary, ranging from low- to moderate-intensity urban areas to forested vistas up mountain slopes. The communities along the northern boundary of the installation—Saturn Pointe, Pathfinder Pointe, and Voyager Village—border the commercial and developed area along Bob Wallace Avenue. Although Redstone Arsenal maintains a partial tree buffer along most of the chain-link fence boundary to break up the view, many residents have undesirable views of development along this route.

No visually sensitive areas can be viewed from any part of the RCI footprint.

4.2.2 Consequences

4.2.2.1 Proposed Action

Short-term minor adverse and long-term moderate beneficial effects would be expected. Construction activities are inherently displeasing aesthetically. During the construction and renovation phase of the RCI program, vistas from various vantage points on the installation would be intruded upon by construction equipment, construction material staging areas, and bare land dotted with buildings undergoing construction or demolition. These effects, however, would be short-term and localized to the areas under construction.

Beneficial effects would also be expected from implementing the CDMP. One of the goals of the RCI is to design communities to complement the natural surroundings and the regional architecture. Manifestation of the CDMP developed by RAFH would achieve aesthetically harmonious communities through the use of cohesive and regionally appropriate architectural design characteristics, landscape planning that focuses on using native plant species and screening visually intrusive structures and activities, and the inclusion of green space. Mature trees and native vegetation would be maintained wherever possible. As a result of the RCI, the overall aesthetic appeal of the housing areas would be greatly improved.

4.2.2.2 No Action Alternative

Long-term minor adverse effects would be expected. Under the no action alternative, the Army would continue to be responsible for maintenance and renovation of existing housing and for new housing construction as necessary. Lack of sufficient funding for this work and the existence of an extensive backlog of work indicate that housing overall would deteriorate over time. Such deterioration would be expected to adversely affect the visual and aesthetic quality of the housing areas.

4.3 AIR QUALITY

4.3.1 Affected Environment

Madison County, Alabama, is within the Tennessee River Valley (Alabama)–Cumberland Mountains (Tennessee) Interstate Air Quality Control Region. Madison County is in attainment for all National Ambient Air Quality Standards.

4.3.2 Consequences

4.3.2.1 Proposed Action

Short-term minor adverse effects would be expected. Construction equipment would generate air pollutants in addition to those already emitted at the installation. Because the installation is in an area that is in attainment for all criteria pollutants, a general conformity review is not required. A Record of Non-applicability (RONA) has been prepared (Appendix B).

4.3.2.2 No Action Alternative

No effects would be expected. No new sources of air pollutants would be introduced under the no action alternative.

4.4 NOISE

4.4.1 Affected Environment

Noise sources at Redstone Arsenal include vehicle traffic on main roads and residential streets; airplanes taking off and landing on the airfield; and ordnance explosions on test areas and training areas. The RCI footprint is in the northernmost portion of the installation. The installation's size and extensive natural features, such as Madkin Mountain and Wheeler National Wildlife Refuge, separate the housing areas from many noise sources. Vehicle traffic is the noise source closest to the RCI footprint. Traffic noise originates from Goss Road (on-post), and Bob Wallace Avenue (off post). The installation airfield is approximately 1.5 miles west of the RCI footprint. Housing areas are mostly removed from ordnance explosions and missile tests because test areas are several miles to the south and west. The closest range, Test Area 3, is approximately 2.5 miles to the west.

4.4.2 Consequences

4.4.2.1 Proposed Action

Short-term minor adverse and long-term minor beneficial effects on noise levels in the housing areas would be expected. Implementation of the proposed action would result in noise exposure during the construction phase due to the operation of construction equipment and construction activities in general. Nearby residents 300 to 400 feet from construction sites would be exposed to daily elevated noise levels. The heavy construction phase of the project would generate the most noise and is estimated to represent 30 to 40 percent of the project timeline. Noise impacts would be limited by scheduling construction work during daytime hours in the course of a standard workweek (Monday through Friday), and this would minimize noise-induced stress and annoyance of residents. Long-term benefits would be realized by removing housing from Housing Areas 1 and 6, the conversion of the vacated areas to green space, and adding additional green space in other areas of the footprint.

4.4.2.2 No Action Alternative

No effects would be expected. Under the no action alternative the RCI program would not be implemented, no construction activities for family housing would occur, and the existing noise environment would remain as it is.

4.5 GEOLOGY AND SOILS

4.5.1 Affected Environment

4.5.1.1 Geologic and Topographic Conditions

Topography. Redstone Arsenal is along the southern edge of the Nashville Dome, at the southeastern edge of the Cumberland Plateau Division of the Appalachian Highlands Physiographic Province (IT Corporation, 2002; USGS and NPS, 2003). The installation's topography consists of two distinct landform classes, erosional highlands and adjacent lowlands.

The highlands tend to form north-south-trending parallel ridges, with Weeden Mountain being the highest point on Redstone Arsenal with an elevation of about 1,240 feet msl (SMC and IERA, 2000). Two peaks along this same ridgeline are in the immediate vicinity of the RCI footprint—Weeden Mountain (elevation 1,210 feet msl) to the south of the footprint and Ward Mountain (elevation 900 feet msl) to the west (USGS, 1991). The lowland topography consists of slightly undulating terrain that gradually slopes south toward the Tennessee River with overall grades of less than 1 percent (IT Corporation, 2002).

Geology. The lowlands of Redstone Arsenal, including the RCI footprint, are underlain by sedimentary geologic units composed of, with the younger (shallower) formations listed first, Tuscumbia Limestone, Fort Payne Chert, and Chattanooga Shale. The highlands are underlain by Saint Genevieve Limestone, Hartselle Limestone, and Bangor Limestone over the Tuscumbia Limestone. The surface geology in the vicinity of the RCI footprint consists of unconsolidated sedimentary material, or regolith, primarily derived from weathering of the Tuscumbia Formation at the surface. The regolith depth ranges from 20 to 40 feet in the vicinity of the RCI footprint (SMC and IERA, 2000).

Redstone Arsenal is underlain entirely by carbonate bedrock, and karst features of varying scales have been identified in site characterization investigations conducted on the installation over the years. Karst features identified at the installation include sinkholes, sinking or disappearing streams, and springs. Subsurface karst features include cavities and solutionally enlarged fractures that have been identified in bedrock well or borehole drilling (IT Corporation, 2002). Collapse of the underground cavities formed from solution weathering has resulted, and would likely continue to result in visible sinkholes on the ground surface. The sinkholes vary widely in size, width, depth, and shape. Extreme weather conditions such as heavy rainfall and drought can increase the potential for sinkholes to form. Sinkholes are difficult to stabilize permanently and can grow or settle during extreme weather or geologic conditions. There are 10 known sinkholes in the vicinity of the RCI footprint (IT Corporation, 2002). When a sinkhole forms on the installation, it is either repaired by filling or plugging, or is simply avoided and/or monitored.

Seismicity. Redstone Arsenal is in Uniform Building Code seismic zone 1, indicating that there is a low probability of earthquakes (SMC and IERA, 2000).

4.5.1.2 Soils

According to the soil survey of Madison County, six soil associations consisting of 39 different soil series are mapped on Redstone Arsenal. The predominant soil type consists of deep, well-drained to moderately well-drained silt loam to silty clay loam. These soils typically have a loamy surface horizon underlain by a loamy to clayey subsoil layer with lenses of silty and/or sandy clay. Rock fragments generally occur throughout the clayey material (SMC and IERA, 2000; Trierweiller et al., 1998). Common soil series found in the RCI footprint include the following, beginning with the most common soil type:

- *Abernathy Silt Loam.* Deep, well-drained to somewhat poorly drained, level (0- to 2-percent slopes) soils found on floodplains. The erosion hazard is slight, but, scouring might occur on some areas. These soils are seasonally wet during winter and early spring and are subject to occasional flooding.
- *Decatur and Cumberland Silty Clay Loams*. Deep, well-drained, gently sloping (2- to 6-percent slopes) soils found on uplands. The erosion hazard is moderate, and most of the original surface layers have been lost from erosion.
- *Hermitage Cherty Silt Loam.* Deep, well-drained, sloping (5- to 12-percent slopes) soils found on uplands, stream terraces, and foot slopes. The erosion hazard is moderate.
- *Decatur and Cumberland Silty Clays.* Deep, well-drained, sloping (5- to 12-percent slopes) soils found on uplands. The erosion hazard is severe, and most of the original surface layers have been lost from erosion.

- *Captina and Capshaw Silt Loams*. Deep, moderately well-drained, nearly level (0- to 1-percent slopes) soils found on uplands and stream terraces. The erosion hazard is slight.
- *Ooltewah Silt Loam*. Deep, poorly-drained, nearly level (0- to 2-percent slopes) soils found on floodplains. The root zone is often restricted by a seasonally high water table. These soils are subject to frequent flooding in the winter and early spring. The erosion hazard is slight.

About 288 acres (64 percent) of the RCI footprint are soil types that are considered highly erodible or potentially highly erodible soils. No hydric soils have been identified in the RCI footprint (NRCS, 2003; SSURGO, 2003).

4.5.1.3 Prime Farmland

The Natural Resources Conservation Service (NRCS) defines prime farmland as nationally important land that has the best combination of physical and chemical characteristics for use as cropland, pastureland, rangeland, or forestland. Prime farmland soils are protected under the Farmland Protection Policy Act (FPPA) of 1981. NRCS is responsible for overseeing compliance with the FPPA and has developed rules and regulations for implementation of the act (7 CFR Part 658).

Though 279 acres (62 percent) of the RCI footprint are of soil types that make them suitable to be considered prime farmland soils (SSURGO, 2003), the land in the RCI footprint has not been used for agricultural purposes since the installation was established in the 1940s and much of the footprint has been developed. Therefore, a Farmland Conversion Impact Rating (Form AD-1006) of the project area is not warranted and no further action is required under the FPPA.

4.5.2 Consequences

4.5.2.1 Proposed Action

Topography. No effects on topography would be expected.

Geology. No effects would be expected. Housing construction would occur only on previously developed areas. Sinkholes, therefore, would not be expected to be a construction issue. If a sinkhole were found, remedial action in accordance with Redstone Arsenal procedures would be taken.

Soils. Short-term minor adverse effects would be expected. Soil erosion would likely result from ground disturbance by construction equipment. These effects would be minimized, however, by using appropriate best management practices (BMPs) for controlling storm water runoff and erosion. RAFH would comply with Alabama state requirements for soil protection and runoff reduction BMPs.

In accordance with Alabama regulations, RAFH would file a Construction BMP Plan with the state before initiating any land-disturbing activity that affects more than 1 acre.

Prime Farmland. No effects would be expected.

4.5.2.2 No Action Alternative

No effects would be expected. No construction or other ground-disturbing activities would occur under the no action alternative.

4.6 WATER RESOURCES

4.6.1 Affected Environment

4.6.1.1 Surface Waters

McDonald Creek drains the RCI footprint and flows south along the eastern boundary of Redstone Arsenal before joining Huntsville Spring Branch. It is classified by the Alabama Department of Environmental Management (ADEM) as suitable for fish and wildlife use.

4.6.1.2 Groundwater

The groundwater hydrology at Redstone Arsenal is characterized by three units: the regolith, the Tuscumbia Limestone and Fort Payne Chert, and the Chattanooga Shale. The Tuscumbia Limestone and Fort Payne Chert compose the limestone aquifer. The upper regolith and the Chattanooga Shale are relatively impermeable, and they act as the confining units above and below the limestone aquifer. Groundwater movement reflects the topography and is generally from north to south toward the Tennessee River. The aquifers beneath the installation are some of the most productive in Madison County. None of the aquifers in Madison County have been designated as sole principal drinking water sources under Section 1424(2)g of the Safe Drinking Water Act of 1974 (SMC and IERA, 2000).

Past waste-handling and generation activities, including the manufacture of chemical weapons and testing of rocket motors, have resulted in potential contamination of the groundwater at Redstone Arsenal. Groundwater is being monitored for contamination at test wells across the installation. The Army has initiated groundwater remediation on several sites and expects complete cleanup to be finished by 2010 (SMC and IERA, 2000).

4.6.1.3 Floodplains

The 100-year floodplain of McDonald Creek extends into the RCI project footprint near Housing Areas 1 and 6 (Figure 4-3) (Redstone Arsenal, 2001).

4.6.2 Consequences

4.6.2.1 Proposed Action

Short-term negligible adverse effects on surface waters would be expected. Erosion following soil-disturbing construction activities could lead to a short-term increase in surface runoff to McDonald Creek. RAFH would comply with Alabama regulations for surface water protection during ground-disturbing construction activities, including complying with the SWPPP and implementing BMPs.

Groundwater. No effects on groundwater resources would be expected. RCI-related activities would not be expected to affect groundwater resources, and RAFH would be prohibited from making groundwater withdrawals (see Section 2.2.1.1)

Floodplains. No effects would be expected. Housing Areas 1, 6, and 10a border the 100-year floodplain of McDonald Creek, but the floodplain does not extend to the area where housing units are located and where construction activities would occur.

4.6.2.2 No Action Alternative

No effects on water resources would be expected.

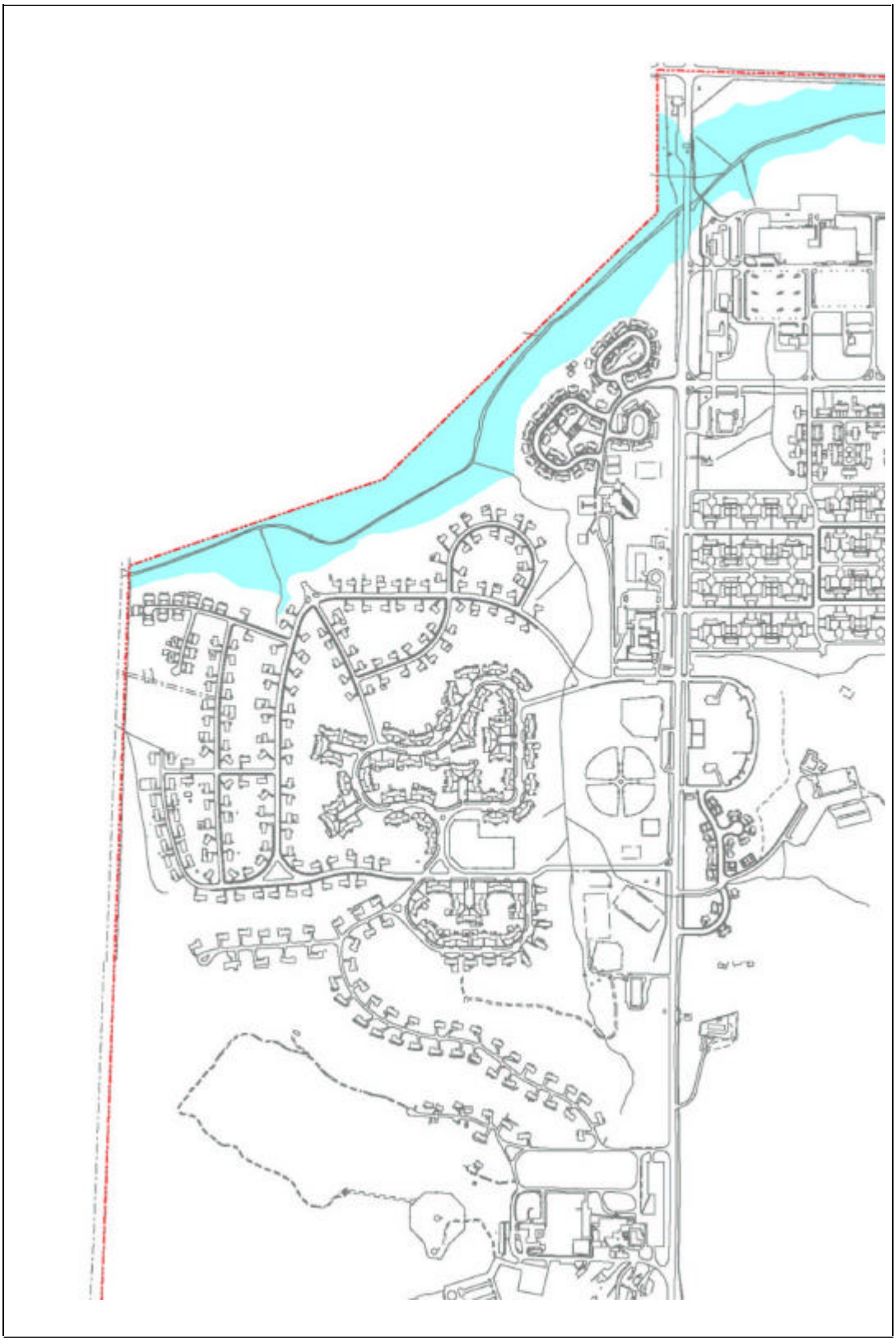
4.7 BIOLOGICAL RESOURCES

4.7.1 Affected Environment

4.7.1.1 Vegetation

The Alabama Natural Heritage Program (ALNHP) indicates that the variety of vegetative communities found on Redstone Arsenal support 242 plants species, including herbaceous vegetation (SMC and IERA, 2000). Upland vegetation communities consist of mowed areas and early-successional-stage fields, or forest. Forests are hardwood, pine, or pine-hardwood mix, and constitute 40 percent of installation acreage. The remaining acreage is scrub or pasture.

Improved areas, including lawns within the RCI footprint, have been planted with grasses like common Bermuda, Tifton Bermuda, zoysia, emerald, and fescue. Wooded areas fringe the east and west boundaries of the RCI footprint and are interspersed between housing areas.



McDonald Creek 100-year Floodplain in the Vicinity of the RCI Footprint

Figure 4-3

LEGEND

100-Year Floodplain

Source: Redstone Arsenal DPW, 2003.

Chestnut oak (*Quercus prinus*), blue beech (*Carpinus caroliniana*), water oak (*Q. nigra*), sweetgum (*Liquidambar styraciflua*), tulip poplar (*Lirodendroan tulipifera*), sugarberry (*Celtis laevigata*), and willow oak (*Q. phellos*) generally dominate mixed hardwood canopies. Middle-story species include the canopy species and red bud (*Cercis canadensis*), black gum (*Nyssa sylvatica*), and eastern red cedar (*Juniperus virginiana*). Ground cover among the hardwoods is generally sparse (SMC and IERA, 2000).

The pine community is dominated by loblolly pine (*Pinus taeda*) and some shortleaf pine (*Pinus echinata*). Most of the older stands are very dense with minimal ground cover. Middlestory and shrub species that can be found in more open areas include pines, box elder (*Acer negundo*), sweetgum, blackberry, mimosa (*Albizzia julibrissin*), greenbrier, sassafras (*Sassafras albidum*), staghorn, winged sumacs (*R. copallina*), honey locust (*Gleditsea triacanthos*), grape, and young white oak (*Q. alba*). Japanese honeysuckle, poison ivy, broomsedge (*Andropogon* sp.), grasses, asters, and components of upper layers dominate the herbaceous layer. Much of the open forested land is covered with kudzu (*Pueraria lobata*), a nonnative invasive species that threatens the survival and diversity of natural vegetation.

4.7.1.2 Wildlife

The diverse habitats represented at Redstone Arsenal support a wide variety of wildlife, and diversity is particularly rich in the 4,000-acre Wheeler National Wildlife Refuge. Collectively, the wide range of upland, wetlands, and aquatic habitats and the large size of the installation result in use of the area by a large number of wildlife species (SMC and IERA, 2000).

More than 40 species of mammals, more the 250 species of birds, 51 species of reptiles, and 29 species of amphibians have been recorded at the refuge. Redstone Arsenal provides habitat suitable for red and gray fox, bobcat, mink, opossum, rabbit, beaver, gray squirrel, woodchuck, coyote, raccoon, and skunk (SMC and IERA, 2000). Many of these species are associated with urbanized areas and would be expected to be found in or near housing areas. Common birds, reptiles, and amphibians would also be expected to be found in appropriate habitats within and near the RCI footprint.

4.7.1.3 Rare, Threatened, and Endangered Species

Six species listed as endangered or threatened by the U.S. Fish and Wildlife Service (USFWS) have been recorded on Redstone Arsenal (Table 4-3). Bald eagles and American peregrine falcons are known to use the installation for forage and resting infrequently during winter migration. Gray bats are known to forage in Redstone Arsenal's forested wetlands and riparian areas, although no colony caves have been identified on the installation. The American alligator was introduced onto the installation by the USFWS in an attempt to control beaver populations in Wheeler National Wildlife Refuge, 5,000 acres of which is on Redstone Arsenal. Although alligators are permanent residents, they have been downlisted to "threatened due to similarity of appearance." A full listing of threatened and endangered species known to occur on the installation in provided in Table 4-4.

The Nature Conservancy conducted a study to identify federally listed and state-listed species, as well as species tracked by the ALNHP. The study listed 12 sensitive plant species and 11 sensitive animal species that inhabit Redstone Arsenal (Table 4-4). None of the federally listed or state-listed species are known to occur within or near the RCI footprint.

4.7.1.4 Wetlands

More than 20 percent of Redstone Arsenal lands are considered wetlands. Wetland communities at Redstone Arsenal include palustrine forested wetlands in riparian areas associated with the major floodplains, including McDonald Creek (RASA-DEM, 2002). Eleven acres of wetlands east of the housing areas are the only ones within or near the RCI footprint (Figure 4-4).

Table 4-3
Federally Listed Species and Species of Concern at Redstone Arsenal

Scientific Name	Common Name	Federal Status	State Status
Palaemonias alabamae	Alabama cave shrimp	LE	SP
Myotis grisescens	Gray bat	LE	SP
Haliaeetus leucocephalus	Bald eagle	LT	SP
Falco peregrinnus anatum	Peregrine falcon	LE	SP
Etheostoma tuscumbia	Tuscumbia darter	Species of Concern	SP
Alligator mississippiensis	American alligator	Similarity of Appearance	--
Apios priceana	Price's potato bean	LT	--
Eriogonum longifolium var. *harperi*	Harper's umbrella plant	Species of Concern	--
Panax quinquefolius	Ginseng	C	Regulated by permit
Trillium pusillum var. *alabamicum*	Dwarf trillium	Species of Concern	--

Note: SP = Species protected by Nongame Species Regulation

LE = Federally listed endangered species (in danger of extinction throughout all or a significant portion of its range)

C = Candidate

LT = Federally listed threatened species (likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range)

Table 4-4
Sensitive Flora and Fauna of Redstone Arsenal

Scientific Name	Common Name	Federal Status	State Status	ALNHP Status
Apios priceana	Price's potato bean	LT	--	G2S1
Eriogonum longifolium var. harperi	Harper's umbrella plant	SP	SP	G4S2
Hottonia inflata	Featherfoil	--	--	G4S2
Leavenworthia uniflora	Michaux's glade cress	--	--	G4S2
Monotropa hypopithys	Pinesap	--	--	G5S2
Ophioglossum engelmannii	Limestone adder's tongue	--	--	G5S2S3
Panax quinquefolius	American ginseng	C	--	G4S4
Sida elliottii	Elliott's fan petal	--	--	G4G5S2
Silphium brachiatum	Cumberland rosinweed	--	SP	G2S2
Trillium upsilon var. albamicum	Dwarf trillium	--	SP	G3S2
Oronectes australis australis	Cave crayfish	--	--	G4S3
Palaemonias alabamae	Alabama cave shrimp	LE	SP	G1S1
Typhlicthys subterraneus	Southern cavefish	--	SP	G3S3
Aneides aeneus	Green salamander	--	SP	G3G4S3

Table 4-4
Sensitive Flora and Fauna of Redstone Arsenal (cont.)

Scientific Name	*Common Name*	Federal Status	State Status	ALNHP Status
Vireo solitarus	Solitary vireo	--	--	G5S2
Myotis Grisescens	Gray bat	LE	SP	G2S2
Myotis septentrionalis	Northern long-eared bat	--	--	G4S2

Note; SP = Species protected by Nongame Species Regulation

LE = Federally listed endangered species (in danger of extinction throughout all or a significant portion of its range)

C = Candidate

LT = Federally listed threatened species (likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range)

G = Global; refers to global ranking across its entire range

S = State; status at the state level

1–5: 1 = species that are most critically threatened and 5 are known in 5 or fewer extant populations. If there are 6 to 20 populations, the designation is a 2. For 21 to 100 known occurrences, the status is a 3. Those species with a 4 or 5 are generally thought to be secure.

4.7.2 Consequences

4.7.2.1 Proposed Action

Short- and long-term negligible adverse effects on vegetation and wildlife would be expected. Vegetation and wildlife habitat within the RCI footprint are highly disturbed except for some forest edges on the periphery. Landscaping vegetation in existing housing areas could be damaged or removed during the RCI project. New landscaping using native species, however, would be planted following construction. Common wildlife species habituated to human presence would be expected to be displaced during housing construction and to return after the construction was completed. No impacts on federally or state-listed threatened or endangered species or species of concern would be expected because these species are not present in or adjacent to the RCI footprint.

Short-term negligible indirect adverse effects on wetlands would be expected. Wetland areas near Housing Areas 1, 6, and 10a would not be directly affected by the RCI program, though an indirect effect as sediment runoff from construction areas could occur. If required, RAFH would obtain a U.S. Army Corps of Engineers Section 404 permit and the permit would specify any required compensatory mitigation.

4.7.2.2 No Action Alternative

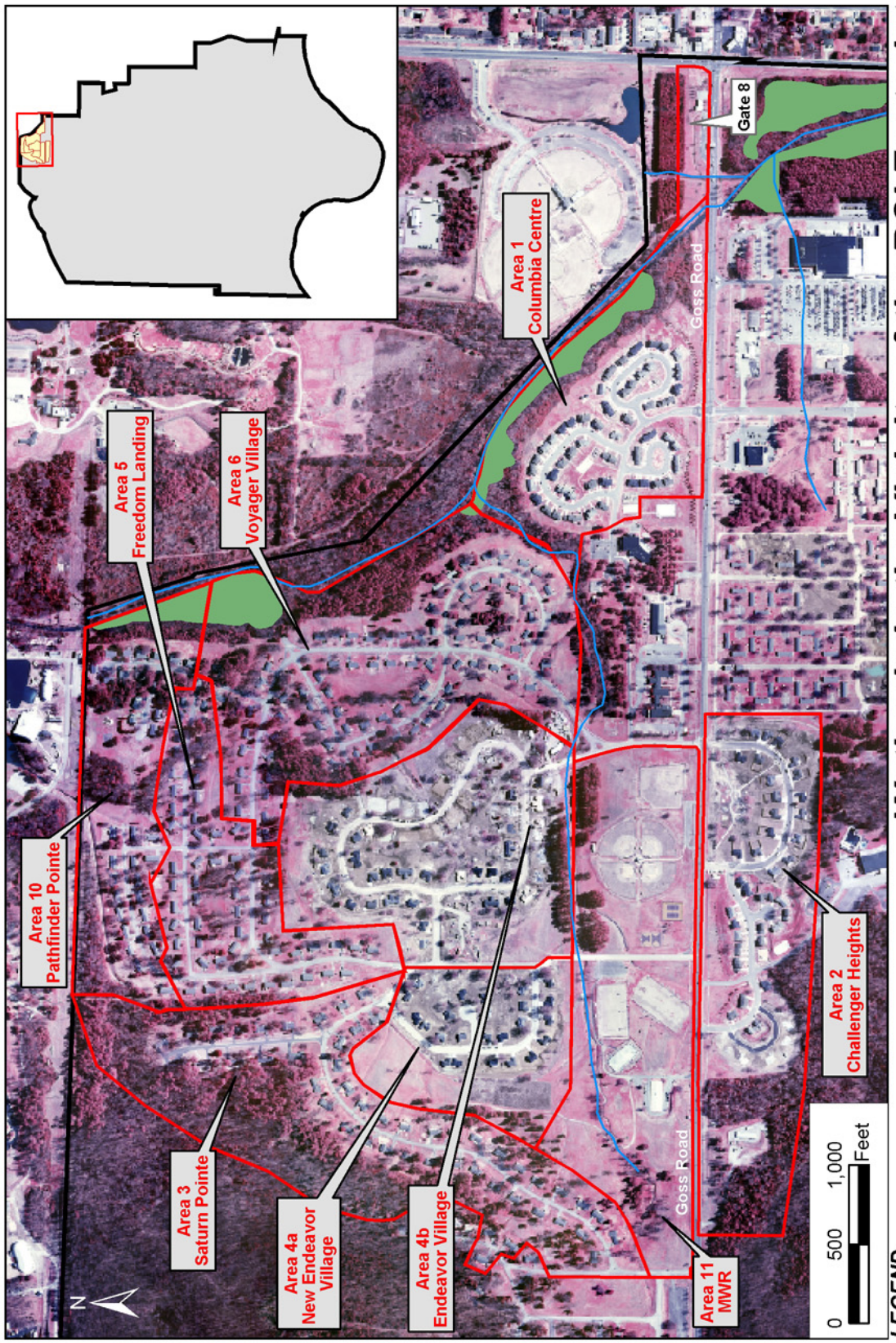
No effects would be expected. No actions adverse to vegetation, wildlife, sensitive species, or wetlands would occur under the no action alternative.

4.8 CULTURAL RESOURCES

4.8.1 Affected Environment

4.8.1.1 Prehistoric and Historic Background

The Integrated Cultural Resources Management Plan (ICRMP) for Redstone Arsenal, Alabama (Trierweiller et al., 1998) contains a detailed description of the prehistoric and historic background for the project area and is incorporated by reference. At the end of 2005, the ICRMP was being revised; after revision, it would be reviewed again before being approved, possibly by May 2006 (Wu, personal communication, 2005).



Wetlands in the Vicinity of the RCI Footprint

Figure 4-4

4.8.1.2 Status of Cultural Resource Inventories and Section 106 Consultations

Redstone Arsenal contains a large number and diversity of potential archeological resources. To date, 100 percent of Redstone Arsenal, including the project area, has undergone a Phase I archeological survey (Alexander et al. 1998; McNutt et al. 1998), and the Alabama State Historic Preservation Officer (SHPO) has concurred with the findings of the surveys (Pearsall, personal communication, 2004; Wu, personal communication, 2004). No National Register of Historic Places (NRHP)-recommended-eligible archeological sites are within the project area. The project area is clear from an archeological perspective.

At least 47 cemetery locations have been identified within the boundaries of the installation, and some have graves dating back to the 1820s. Most of the cemeteries on the installation date from the late 19th century to the early 20th century and are rural vernacular in design. No famous persons are known to be buried on Redstone Arsenal, and none of the identified cemeteries are related to important historical events.

Five separate architectural inventories and assessments have been conducted at Redstone Arsenal. The World War II and Cold War Era Exceptional Significance Inventories of Standing Structures have been completed. At least 835 World War II-era buildings have been inventoried to date (Pearsall, personal communication, 2004). No historic properties within Redstone Arsenal's jurisdiction have been listed on the NRHP. Of the total number of buildings and structures at the installation, 438 have been assessed as eligible for the NRHP but have not been nominated, 1,010 have been assessed as not eligible, and 293 have not been explicitly assessed because they are utilitarian or residential buildings of no special architectural or historical interest. Of the 438 historic properties and structures categorized as NRHP-eligible, 414 are World War II-era structures, 23 date to the Cold War era, and one is pre World-War II (Trierweiller et al., 1998; Wu, personal communication, 2005).

Within the proposed RCI footprint, there are no NRHP-listed, eligible, or potentially eligible historic structures or buildings. None of the eight designated historic districts under Redstone Arsenal's jurisdiction fall within the proposed RCI footprint. The Guided Missile Center Historic District is the historic district closest to the footprint but is outside it, to the west of Bonford Road.

There are 121 Capehart-era housing units within the proposed RCI footprint (Pearsall, personal communication, 2004). In May 2002 the Advisory Council on Historic Preservation and the National Park Service approved a Program Comment that completes the Army's compliance with the NHPA with respect to management of its inventory of Capehart- and Wherry-era family housing, associated structures, and landscape features. Although the Program Comment assumes that all Capehart- and Wherry-era housing is eligible for the NRHP, it allows the Army to proceed with actions involving maintenance and repair, rehabilitation, layaway and mothballing, renovation, demolition, replacement, and transfer, sale, or lease out of federal control of all Capehart- and Wherry-era housing units without further Section 106 consultation.

Consultation is under way with the Alabama SHPO regarding the proposed RCI action. The relevant correspondence is in Appendix C.

4.8.1.3 Native American Resources

Apart from archeological sites, there are no known Native American resources within the RCI footprint. No traditional cultural properties of Native American sacred places are known to be present at Redstone Arsenal.

In 1996 a Native American Graves Protection and Repatriation Act (NAGPRA) Section 5 inventory was completed. It showed that Native American human remains and funerary objects had been collected during three different projects at Redstone Arsenal between 1978 and 1986. More than 300 skeletal elements representing at least 11 persons, as well as more than 50 potential funerary objects, were documented (USACE, St. Louis District, 1996).

Federally recognized tribes that might have affiliation with the remains present on Redstone Arsenal are the Eastern Band of Cherokee Indians, the Cherokee Nation of Oklahoma, the Chickasaw Nation, the Choctaw Nation of Oklahoma, the Alabama Coushatta Tribe of Texas, the Coushatta Tribe of Louisiana, the Alabama Quassarte Tribal Town, the Muskogee (Creek) Nation, the Kialegee Tribal Town, the Poarch Band of Creek Indians, the Thlopthlocco Tribal Town, the Seminole Nation of Oklahoma, the Absentee Shawnee, the Eastern Shawnee Tribe of Oklahoma, and the Shawnee Tribe of Oklahoma. The Tunica-Biloxi are making NAGPRA claims to materials recovered on Redstone Arsenal. There are no tribes involved in the environmental notification process for the proposed RCI activities at Redstone Arsenal (Pearsall, personal communication, 2004).

4.8.2 Consequences

4.8.2.1 Proposed Action

No effects on cultural resources would be expected from implementation of the proposed action. If unknown deposits or remains were to be discovered during construction, activities would cease until the appropriate installation personnel, as well as the Alabama SHPO, were contacted and a determination was made regarding the NRHP eligibility of the site. If NRHP-eligible, the sites would be treated in accordance with procedures outlined in the ICRMP and in consultation with the Alabama SHPO, which would help ensure their preservation. No cemeteries within the RCI footprint would be expected to be affected.

4.8.2.2 No Action Alternative

No effects on cultural resources would be expected.

4.9 SOCIOECONOMICS

4.9.1 Affected Environment

4.9.1.1 Economic Development

This section describes the economy and the sociological environment of the region surrounding Redstone Arsenal. The socioeconomic indicators used for this study include regional economic activity, population, housing, and schools. In addition, recreational and community facilities and public and social services are discussed. These indicators characterize the region of influence (ROI).

The ROI is based on the market area used in the *Redstone Arsenal 2002 Family Housing Market Analysis*, conducted by Robert D. Niehaus, Inc. The market area was defined as the communities within a 20-mile radius of the installation. Based on this analysis, the ROI for the social and economic environment includes Madison, Marshall, Morgan, and Limestone counties in Alabama. The ROI covers an area of 2,522 square miles. Redstone Arsenal is in Madison County and borders the city of Huntsville to the southwest. Huntsville is the principal commercial and services center for the region (Niehaus, 2003).

The baseline year for socioeconomic data is 2001, the year for which most socioeconomic indicators are reasonably available. Where 2001 data are not available, the most recent data available are presented.

Employment. Manufacturing, government and government enterprises, retail trade, and professional and technical services were the primary sources of employment in the ROI in 2001. Together these industry sectors accounted for more than 50 percent of regional employment.

The largest source of jobs in the ROI was the manufacturing sector, which accounted for 17.9 percent of total employment (US DOC, BEA, 2003a). The second largest employer in the ROI was the government and government services sector, which accounted for 17 percent of regional employment. Redstone Arsenal employs about 17,000 persons and affects the local economy

through the direct employment of these military and civilian personnel, as well as through the local procurement of goods and services (GlobalSecurity, 2002).

The third largest employer was retail trade, which accounted for 11.6 percent of regional employment. The professional and technical services sector, a growing industry in the ROI, employed 9.1 percent. Several nationally recognized computer and electronics companies (e.g., Intergraph Corporation, SCI Systems, Avex Electronics, ADTRAN, and Cybex Computer Products Corporation), government agencies such as NASA's Marshall Space Flight Center and the U.S. Army Aviation and Missile Command, and government contractors (e.g., Boeing, Lockheed Martin, Nichols Research, Teledyne Brown Engineering, and Computer Sciences Corporation) have established Huntsville as a nationally recognized high-technology sector (Chamber of Commerce of Huntsville/Madison County, 1999).

All other industry sectors (accommodation and food services; administrative and waste services; arts, entertainment, and recreation; construction; educational services; farming; finance and insurance; forestry and fishing; health care and social assistance; information; management of companies and enterprises; mining; other services except public administration; real estate and rental and leasing; transportation and warehousing; utilities; and wholesale trade) each accounted for 6 percent or less of regional employment (US DOC, BEA, 2003a).

Unemployment. The ROI's annual average unemployment rate for 2001 was 4.3 percent. Within the ROI, Marshall County had the highest unemployment rate at 6.1 percent and Madison County had the lowest at 3.4 percent. For comparison, the unemployment rate for Alabama was 5.3 percent and that for the United States was 4.7 percent (Alabama DIR, 2003; US DOC, BLS, 2003).

Income. The per capita personal income (PCPI) for the ROI was $26,994 (US DOC, BEA, 2003b). Madison County had the highest PCPI in the ROI at $30,126, and Marshall County had the lowest at $20,860. For comparison, the PCPI for Alabama was $24,477 and the PCPI for the United States was $30,413 (US DOC, BEA, 2003b).

4.9.1.2 Demographics

Table 4-5 shows the ROI's population in 1990 and 2001, with comparative data for Alabama and the United States. The ROI's population grew by 16 percent, 6 percent more than that of the state of Alabama and slightly above the rate for the United States. The population increase was due largely to net migration, with the strongest growth focused in suburban metropolitan counties such as Madison and Limestone, which are part of the Huntsville Metropolitan Statistical Area (UA News, 2000).

Table 4-5
ROI Population

Location	1990[1]	2001[2]	Percent Change, 1990–2001
Madison County	238,912	281,931	18
Marshall County	70,832	82,329	16
Morgan County	100,043	111,429	11
Limestone County	54,135	66,980	24
ROI	465,912	542,669	16
Alabama	4,040,587	4,464,356	10
United States	248,709,873	284,796,887	15

[1] Source: US DOC, Census, 1990.
[2] Source: US DOC, Census, 2003.

4.9.1.3 Housing

On-post family housing. Redstone Arsenal has 459 family housing units located in 7 housing areas in the northern portion of the installation. The age and condition of Redstone Arsenal's family housing is addressed in Section 1.2, and the housing subdivisions are described in Section 2.2.1.2. Three hundred and fifty units are designated for enlisted personnel, and 109 units are for officers. The family housing consists of 66 two-bedroom units, 237 three-bedroom units, 148 four-bedroom units, and 8 five-bedroom units. Demand for on-post family housing exceeds supply. On-post housing is fully occupied, though some units might be temporarily unavailable to allow for maintenance to be completed between tenants. The waiting time for on-post family housing ranges from 4 months to 1 year, depending on rank and number of bedrooms required (PCSHouseExpress, 2002).

Off-post housing. There are not enough housing units on the installation to house all military families stationed at Redstone Arsenal. For military personnel who must live off-post because on-post housing is full, or for those who choose to live off-post, the Community Homefinding Relocation and Referral Services Office of the Redstone Arsenal Housing Division assists soldiers and their families with finding off-post housing.

Uniformed personnel who live off-post are given a BAH. BAH is listed on a soldier's pay stub as an entitlement, or allotment, and is nontaxable income for paying rent or a mortgage. Table 4-6 lists BAH by rank for 2002. Current DoD policy, however, does not mandate that BAH meet all housing costs for uniformed personnel and their families. If necessary, each soldier is expected to pay an "out-of-pocket" (OOP) expense to meet additional housing costs, such as the cost of utilities.

OOP varies by pay grade and ranges from $99 per month for enlisted personnel up to $174 per month for officers (Table 4-6). The sum of BAH and OOP equals the maximum acceptable housing cost (MAHC). If a military member finds it necessary to pay more than MAHC to obtain adequate housing, that member is, by definition, in unacceptable housing. In the Redstone Arsenal area, MAHC ranges from $662 to $1,207 per month, depending on grade (Table 4-6). Based on current DoD guidance, it is assumed that OOP will be reduced to zero by 2007 and that BAH rates will increase to reflect projected rent plus utility costs within the market area (Niehaus, 2003).

Table 4-6
BAH, OOP, and MAHC for Redstone Arsenal, 2002

Pay Grade	BAH	OOP	MAHC
E1 through E9	$563–$690	$99–$132	$662–$822
W1 through W4	$731–$952	$139–$164	$870–$1,116
O1 through O6+	$731–$1,033	$139–$174	$870–$1,207

Source: Niehaus, 2003.

Table 4-7 lists information on rental rates for off-post housing in the ROI. Comparing BAH in Table 4-6 to the cost of housing in Table 4-7 indicates that BAH is generally in line with market rental rates. However, military personnel living off-post, especially enlisted personnel with dependents (i.e., those in need of a home with three or more bedrooms), could still have housing costs greater than their BAH.

Table 4-7
Off-Post Housing Market Cost Information

Type of Housing	Median Monthly Rent	Average Monthly Utility and Renter's Insurance Cost	Total Average Monthly Housing Cost
Two bedrooms	$400	$141	$541
Three bedrooms	$750	$171	$921
Four+ bedrooms	$955	$221	$1,176

Source: Niehaus, 2003.

The off-post housing market area is defined as those communities within a 20-mile radius of the installation. The housing stock is estimated at 135,500 units, up from 102,400 units in 1990, reflecting an average annual growth of 2.4 percent per year (Niehaus, 2003). The overall vacancy rate in 2002 was 7.1 percent, up from 6.7 percent in 1990 and consistent with the relatively more rapid increase in housing development compared to population growth in the region. However, the overall vacant housing inventory includes all vacant units, including vacant units for sale, vacant units for rent, boarded-up units, and vacant units held for seasonal and recreational use. For the rental-housing component of the market, vacancy rates are estimated at 10.2 percent, up from the 9.6 percent estimated in 1990. Forecasts are for stabilization in the housing markets, with overall vacancy rates falling to 6.7 percent and rental vacancy rates dropping to 9.7 percent (Niehaus, 2003).

Housing quality in the market area is mixed. The share of substandard rentals in the ROI rental inventory, based on DoD criteria, is estimated at 18 percent of the entire rental stock. The quality of the remaining 82 percent of the rental inventory is considered adequate for military families (Niehaus, 2003).

In summary, the *Family Housing Market Analysis* determined that there was a total requirement for government-provided family housing on Redstone Arsenal of 395 units in 2002 and there is a projected total requirement of 230 units in 2007 (Niehaus, 2003). These determinations were based on the number of families stationed at Redstone, the quantity and quality of the off-post housing stock, and the Army's criteria for housing affordability and adequacy.

4.9.1.4 Quality of Life

Law enforcement services. The Redstone Arsenal Military Police (MPs) conduct police operations from a station in Building 3623. The MP station is staffed by 20 military and 32 Department of the Army civilians for a total of 52 law enforcement officers. Services include policing operations, patrols, and general and AWOL (absent without leave) investigations and training. Police use sedans, all-terrain vehicles, and bicycles in their patrolling operations. The MPs work closely with local law enforcement agencies when their services are required.

Fire protection services. The Redstone Arsenal Fire Department operates from three stations in Building 3320 on Vincent Drive, Building 4424 on Rideout Road, and Building 7801 on Patton Road. A fourth station in Building 4813 at the Redstone Arsenal Army Airfield is out of operation. The Redstone Arsenal Fire Department consists of three engine companies, one ladder company, one rescue unit, and one hazardous material unit that includes a van, two command vehicles, and administrative offices. The Fire Prevention Section is in Building 4488. The Fire Department has Mutual Aid Agreements with local communities for fire protection and hazardous material responses.

Medical services. The Fox Army Health Center at Redstone Arsenal is an ambulatory care center consisting of a primary care clinic, pediatric clinic, internal medicine clinic, surgical clinic, physical therapy, optometry clinic, occupational medicine clinic, and public health and education center. The center also provides pathology, radiology, and pharmacy services. The dental clinic shares space in the same building. The Fox Army Health Center received the Surgeon General's Award for Excellence in Customer Service and Resource Efficiency in 2002 (Fox AHC, 2003).

Off-post medical facilities provide a comprehensive range of health care services. The Crestwood Medical Center, Huntsville Hospital, and HealthSouth Rehab Hospital of North Alabama are in Huntsville. Crestwood Medical Center and Huntsville Hospital offer in-patient and out-patient services; 24-hour emergency rooms; obstetrical/maternity care; surgical services; and specialty services such as cancer, diabetes, and behavioral health treatment (Crestwood Medical Center, 2003; Huntsville Hospital, 2001). Crestwood has 120 beds, and Huntsville Hospital has 900 beds (ALAHA, 2003). The HealthSouth Rehab Hospital is a 50-bed facility that offers rehabilitation services to those recovering from injury or illness. In addition to the 3 hospitals in Huntsville, there are nine other hospitals in the ROI with a total of 1,106 beds. One is in the city of Madison in Madison County, one is in Limestone County, two are in Marshall County, and five are in Morgan County (ALAHA, 2003).

Schools. The U.S. Department of Education provides federal impact aid to school districts that have federal lands within their jurisdiction. This federal impact aid is authorized under Public Law 103-382 as payment in lieu of taxes that would have been paid if the land was not held by the federal government. School districts receive federal impact aid for each student whose parent or parents live on or work on federal property.[4] The amount of federal impact aid a school district receives is dependent on the number of "federal" students the district supports in relation to the total district student population. Schools receive more federal impact aid for students whose parents both live and work on federal property. Total federal impact aid varies annually according to congressional appropriations for the program but has ranged from $200 to $3,000 per pupil.

Redstone Arsenal has no primary or secondary education schools on-post. Children living on-post attend J.E. Williams Elementary School, J.E. Williams Technology Middle School or Westlawn Middle School, or Butler High School in Huntsville. The schools are part of the Huntsville City School District. The district receives the highest level of federal impact aid for the Redstone Arsenal students since the children live on the installation but attend an off-post school. The Huntsville City School District had a student enrollment of 22,762 for the 2001–2002 school year; the student-to-teacher ratio was 15:1 (NCES, 2003).

Children living off-post can attend one of the 12 public school districts in the ROI. Madison County has three districts (including the Huntsville City District discussed above), Marshall County has four, Morgan County has three, and Limestone County has two (NCES, 2003). The school districts in the ROI receive federal impact aid for dependents of Redstone Arsenal military and civilian employees attending their schools. Because the children attending these schools live off-post, the schools receive a lower level of federal impact aid per student than they would receive if the children lived on-post.

The ROI has a number of colleges and universities, including Alabama A&M University, University of Alabama in Huntsville, Embry-Riddle Aeronautical University—Alabama Center, Calhoun State Community College, Athens State University, and Snead State Community College.

[4] "Military A" students are dependents of military employees residing on federal property. "Military B" students are dependents of military employees not residing on federal property. School districts receive the highest level of federal impact aid for Military A students and a lower level of federal impact aid for Military B students.

Family support. Redstone Arsenal has a number of Army programs and services in place to assist employees and their families. Army Community Service provides budget counseling, check writing classes, money management guidance, and retirement planning services. The Army Community Service office helps spouses and family members of military personnel find employment in the local area. Army Emergency Relief is a private, nonprofit organization established to assist soldiers and their family members in emergency financial situations caused by no fault of their own. The Drug and Alcohol Program provides counseling to individuals or families dealing with substance abuse. The Family Advocacy Program provides educational programs and training to active duty soldiers, retirees, and their family members in areas such as stress management, parenting skills, new parent support, couples communication, anger management, and effectiveness training for women. SAS offers before- and after-school care programs during the school year and a full-day program during the summer and on non-school days.

Shops and services. Redstone Arsenal has a commissary and a PX. The commissary includes a bakery, a deli, and a seafood shop. The PX offers the convenience of one-stop shopping. In addition to the PX, there are barber and beauty shops, banks, a florist, laundry and dry cleaners, optical shop, furniture store, and a food court.

Huntsville provides many retail and commercial services for the region. The city has many national chain stores, hotels, and restaurants in addition to specialty small businesses.

Recreation. Many recreational facilities are available on Redstone Arsenal. Outdoor recreation activities include fishing, hiking, skeet and trap shooting, camping along the Tennessee River, hunting (in specified areas with a permit), golf, and archery. The installation has three outdoor swimming pools open from Memorial Day to Labor Day, sport courts (e.g., tennis, volleyball, basketball), softball fields, and a disc golf course.

Redstone Arsenal also has a bowling alley, an auto skills center, an arts and craft center, a gymnasium, two fitness centers, a youth sports complex, a library, a computer lab, and it offers bingo games. The installation also sponsors youth sports leagues, tournaments, and an annual Oktoberfest.

Huntsville is known as "America's Space Capital" because it is home to Redstone Arsenal, where the first rockets were developed for the U.S. Army; NASA's Marshall Space Flight Center; and the U.S. Space and Rocket Center. Huntsville has 48 parks, 11 recreation centers, and 3 swimming pools, as well as public golf courses, tennis courts, bicycle paths, a botanical garden, and an art museum. The city sponsors community events throughout the year, such as pog tournaments, fishing rodeos, flea markets, drive-in movies, and concerts in the park (City of Huntsville, 2003).

The ROI offers many opportunities for outdoor recreation. Lake Guntersville, on the Tennessee River about 40 miles southeast of Huntsville in Marshall County, is a popular place for boating, fishing, and swimming. Lake Guntersville State Park, covering 5,600 acres, has an 18-hole championship golf course, a 322-site campground, and a lodge and convention center (Lake Guntersville Chamber of Commerce, 2002). The Wheeler National Wildlife Refuge (part of which is on Redstone Arsenal) has a visitor center and offers environmental education programs and activities such as boating, hiking, fishing, hunting, bicycling, and wildlife observation and photography (USFWS, no date). Monte Sano State Park, east of Huntsville, has trail hiking, a Japanese garden, and a planetarium.

Homeless and other special programs. The region has a number of shelters and assistance programs for individuals and families in need of temporary placement due to lack of fixed, regular, or adequate residence. A mix of government and private funding supports these programs.

4.9.1.5 Environmental Justice

On February 11, 1994, President Clinton issued Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority and Low-Income Populations*. The Executive Order is designed to focus the attention of federal agencies on the human health and environmental conditions in minority and low-income communities. Environmental justice analyses are performed to identify potential disproportionately high and adverse human health or environmental effects from proposed federal actions and to identify alternatives that might mitigate potential impacts. Data from the U.S. Department of Commerce *2000 Census of Population and Housing* were used for this environmental justice analysis. Minority populations included in the census are identified as Black or African American, American Indian and Alaska Native, Asian, Native Hawaiian and other Pacific Islander, Hispanic, of two or more races, and other race. Poverty status, used in this EA to define low-income status, is reported as the number of persons with income below poverty level. The 2000 Census defines the poverty level as $8,794 of annual income, or less, for an individual and $17,603 of annual income, or less, for a family of four.

The ROI has a lower percentage of minority residents than either Alabama or the United States. In 2000, 20.5 percent of the ROI population was of a minority race or ethnicity and 2.9 percent of the population was of Hispanic or Latino origin.[5] In Alabama 28.9 percent of the population was of a minority race and 1.7 percent was of Hispanic or Latino origin. For the United States, 24.8 percent was of a minority race and 12.5 percent was of Hispanic or Latino origin (US DOC, Census, 2003).

The Census Bureau bases the poverty status of families and individuals on 48 threshold variables, including income, family size, number of family members under the age of 18 and over 65 years of age, and amount spent on food. In 1999, 11.5 percent of the ROI residents were classified as living in poverty, which is 4.6 percent lower than the poverty rate for the state of Alabama and 1.8 percent lower than that for the United States (US DOC, Census, 2003).

4.9.1.6 Protection of Children

Executive Order 13045, *Protection of Children from Environmental Health and Safety Risks*, requires federal agencies, to the extent permitted by law and mission, to identify and assess environmental health and safety risks that might disproportionately affect children.

Children are present at Redstone Arsenal as residents and visitors (e.g., family housing, schools, users of recreational facilities). The Army takes precautions for their safety through a number of means, including the use of fencing, limitations on access to certain areas, and provision of adult supervision.

As stated in Section 4.12, previous investigations identified hazardous substances (e.g., asbestos-containing materials, lead-based paint) present in housing units on Redstone Arsenal. These materials were widely used in the building products industry and for housing maintenance for many years. It has been determined, however, that their presence in the housing units does not constitute a health hazard under normal circumstances and the materials are being removed or encapsulated as units are renovated.

4.9.2 Consequences

4.9.2.1 Proposed Action

Methodology. Economic effects of the preferred alternative are estimated using the Economic Impact Forecast System (EIFS) model. Details about the model are in Appendix D. The EIFS model is a computer-based economic tool that calculates multipliers to estimate the direct and

[5] Persons of Hispanic or Latino origin may be of any race.

indirect effects resulting from a given action. Changes in spending and employment represent the direct effects of the action. Based on the input data and calculated multipliers, the model estimates ROI changes in sales volume, income, employment, and population accounting for the direct and indirect effects of the action (Table 4-8).

Economic development and demographics. Short-term direct and indirect minor beneficial effects would be expected. The expenditures associated with demolition, construction, and renovation of family housing units and associated facilities at Redstone Arsenal would increase sales volume, employment, and income in the ROI, as determined by the EIFS model (Table 4-8, and Appendix D). The action would create about 135 jobs, increase income by more than $4 million, and business sales by about $18 million. The economic benefits would be short-term, lasting only for the duration of the development period. These changes in sales volume, employment, and income would fall within historical fluctuations (i.e., within the RTV range) and be considered minor. No change in ROI population would be expected. Soldiers might move from off-post to on-post housing, but no change in the number of soldiers stationed at Redstone Arsenal would occur under the proposed action.

Table 4-8
EIFS Model Output for the Proposed Action at Redstone Arsenal

Indicator	Projected Change	Percentage Change	RTV Range
Direct sales volume	$6,602,341		
Induced sales volume	$11,950,240		
Total sales volume	$18,552,580	0.11%	-4.08% to 5.20%
Direct income	$1,505,588		
Induced income	$2,725,114		
Total income	$4,230,702	0.04%	-4.63% to 6.13%
Direct employment	48		
Induced employment	87		
Total employment	135	0.04%	-2.48% to 4.41%
Local population	0	0%	-0.55% to 1.53%

Housing. Long-term major direct beneficial effects on on-post family housing would be expected. Implementing the RCI at Redstone Arsenal would ensure that eligible soldiers and their families would have access to quality, attractive, and affordable housing. The proposed action would improve the condition and aesthetic appeal of on-post family housing through revitalization of existing units and construction of new units. The rent for the new and revitalized housing would not exceed a soldier's BAH.

Quality of life. Short-term direct minor adverse and long-term direct beneficial effects on quality of life would be expected. In the short term, noise and traffic from construction of RCI housing could be disruptive to the existing residents. In the long term, however, overall quality of life for soldiers and their families would be greatly improved through implementation of the RCI at Redstone Arsenal because of the improved condition of on-post family housing, as well as the overall residential community. The proposed action would improve the condition and aesthetic appeal of existing housing through revitalization and construction of new housing, and it would heighten the sense of community through improved and linked open spaces, trail systems to connect neighborhoods, and community centers. The following paragraphs identify the foreseen effects for each of the key components of quality of life.

Law Enforcement and Fire Protection. No effects on law enforcement or fire protection services would be expected. Although the housing units would be sold to the developer, the land on which the buildings stand would only be leased to the developer (i.e., the land would continue to be federal government property). Therefore, Redstone Arsenal would retain legislative jurisdiction. The MP and the installation's fire department would still respond to emergencies in the family housing areas. In addition, because the number of on-post family housing units would not increase, no effects on the demand for law enforcement or fire protection services would be expected to result from implementation of the proposed action.

Medical Services. No effects on medical services would be expected. Implementation of the RCI would not change the eligible population of active duty military, military dependents, or retirees in the region serviced by on-post and civilian facilities.

Schools. Long-term minor adverse effects would be expected. The proposed action would reduce the on-post inventory of family housing. More families would live off-post. Because schools receive a lower level of federal impact aid for children living off-post, federal impact aid to schools would decrease.

Family Support Services. No effects on family services would be expected. The eligible population of active duty military, dependents, and retirees in the region would not change.

Shops and Services. No effects on shops and services would be expected. The eligible population of active duty military, dependents, and retirees in the region would not change.

Recreation. Long-term beneficial effects would be expected to result from implementation of the proposed action. The RCI could also include additional ancillary supporting facilities, such as walking trails, parks, recreation areas, and community centers. Along with the existing facilities that already serve Redstone Arsenal residents, these additional facilities would accommodate the new housing areas and improve recreational opportunities throughout the housing developments.

Environmental justice. No effects would be expected. Implementation of RCI would not result in disproportionate adverse environmental or health effects on low-income or minority populations.

Protection of children. Short-term minor adverse and long-term beneficial effects on the protection of children would be expected. In the short term, because construction sites can be enticing to children, construction activity could be an increased safety risk. During construction, safety measures stated in 29 CFR Part 1926, Safety and Health Regulations for Construction, and AR 385-10, Army Safety Program, would be followed to protect the health and safety of residents on Redstone Arsenal, as well as construction workers. Barriers and "no trespassing" signs would be placed around construction sites to deter children from playing in those areas, and construction vehicles and equipment would be secured when not in use.

Long-term beneficial effects on children would be expected because of reduced exposure to hazardous materials. Hazardous materials (including asbestos-containing materials and lead-based paint) identified in Redstone Arsenal housing units would be abated through removal or encapsulation during renovation or demolition activities. New construction would not use building products containing hazardous materials. These actions would eliminate children's possible exposure to such hazardous materials in on-post family housing.

4.9.2.2 No Action Alternative

Economic development and demographics. No effects would be expected. There would be no change in sales volume or employment in the ROI, and no change in population.

Housing and quality of life. Long-term minor adverse effects would be expected. Continuation of current family housing programs would perpetuate deficiencies in quality of life for soldiers and their dependents. The availability of affordable, quality family housing is a key factor in quality of life and is often given high priority by soldiers and their families. The Army would continue to do regular maintenance on existing housing, as well as some renovation and

demolition, but it would be on a constrained budget over approximately a 30-year period, compared to the 10-year period under the proposed action. Over the 30 years, some housing units would deteriorate, becoming unsuitable for occupancy. This would decrease the inventory of family housing on Redstone Arsenal, forcing military employees and their families to find off-post housing. Depending on the person's rank and number of dependents, he or she could pay more than the MAHC for off-post housing that meets the family's needs.

Other quality of life issues. No effects on law enforcement, fire protection services, medical services, family support services, shops and services, recreation, or homeless and other special programs would be expected to result from implementation of the no action alternative.

Environmental justice. No effects would be expected. There would be no disproportionately high or adverse human health or environmental effects on minority or low-income populations as a result of the proposed action.

Protection of children. Long-term minor adverse effects on the protection of children would be expected. Under current conditions the hazardous materials identified in on-post housing units are not health hazards because they have been contained or removed. As homes would deteriorate, however, the risk of children's exposure to hazardous materials (such as chipping lead-based paint or cracked asbestos-containing tiles) would increase. Section 4.1.12 provides further information on the types of hazardous materials identified in Redstone Arsenal housing units.

4.10 TRANSPORTATION

4.10.1 Affected Environment

A network of primary and secondary roads and pedestrian walkways serves the transportation needs on and around Redstone Arsenal. The following discussion describes this and other transportation resources, their relative use, and their importance to the surrounding community.

4.10.1.1 Roadways and Traffic

Access from off-post highways and roads. Interstate 565 borders Redstone Arsenal to the north and northwest and provides access to the Interstate Highway System. Major state highways in the vicinity of the installation are Memorial Parkway (Highway 231) to the east, Governors Drive (Highway 431) to the northeast, and University Drive (Highway 72) to the north. Drake Avenue (just east of the housing area) links the housing areas to Memorial Parkway; Rideout Road provides direct access to Interstate 565; and Martin Road crosses the installation from east to west, providing access to Memorial Parkway and Huntsville International Airport.

Family housing residents primarily use Gates 8, 9, and 10. Gate 8 is open from 6:00 a.m. to 10:00 p.m., 7 days per week and is east of and adjacent to the housing areas. Visitors are not permitted access at Gate 8. Gate 9 is at Rideout Road and west of the housing areas and is open 24 hours per day, 7 days per week. Gate 10 is southeast of the housing areas at Patton Road and is open from 5:30 a.m. to midnight, Monday through Friday, and 5:30 a.m. to 10:30 p.m. weekends and holidays.

On-post roads. The primary roadways on Redstone Arsenal in the vicinity of the family housing areas are Goss Road, Rideout Road, and Patton Road. Goss Road is the primary access road for the housing areas. Secondary roads serve the housing areas and other functional areas of the installation.

4.10.1.2 Public and Other Transportation

Air. Redstone Army Airfield is on-post, approximately 2.5 miles southwest of the housing areas. It supports the aircraft assigned to the arsenal (and additional NASA and NASA-related flights)

and serves as a refueling stop for military services. The airfield's 7,300-foot runway is large enough to handle a variety of military aircraft (SMC and IERA, 2000).

Huntsville International Airport, which is off-post approximately 5 miles west of Redstone Arsenal, provides commercial passenger and cargo service and operates two (8,000- and 10,000-foot) runways (SMC and IERA, 2000).

Buses. Redstone Arsenal operates a school bus system that picks up military dependent children from the housing areas and transports them to off-post schools (Pearsall, 2004, personal communication). The City of Huntsville operates a bus line that includes a stop near Gate 10 (City of Huntsville, 2001). Off-post commercial taxicab companies also provide transportation service to Redstone Arsenal, including the housing areas (Pearsall, 2004, personal communication). There is no public transportation system service that directly serves the installation, and the installation does not operate a public transportation system to serve the residents and employees of the installation (Pearsall, 2004, personal communication).

Rail. No commuter rail serves the installation.

Waterways. There is no waterborne transportation serving residents or employees of Redstone Arsenal.

4.10.2 Consequences

4.10.2.1 Proposed Action

Short-term minor adverse and long-term minor beneficial effects on transportation would be expected. During RCI construction and renovation, traffic congestion could increase from the addition of construction vehicles, particularly during rush hours. Construction vehicles also would likely increase wear and tear on installation roads. Some roads might require additional maintenance and road closures to accommodate utility construction and installation would be expected and would create short-term traffic delays.

Such effects would be minimized by all RCI construction vehicles gaining access to the installation via Gate 1, which is not a primary access gate for the housing areas. In addition, all construction staging would occur within the footprint where Building 1103 is currently located, at the end of Mountain Road off Goss Road south of the housing areas. This would help reduce construction-caused traffic delays.

Because there would be no increase in the number of on-post housing units, no increase in the traffic volume in the housing areas would be expected once the project was completed. Therefore, no long-term adverse effects would be expected. Because of the long-term reduction in housing inventory, long-term beneficial effects on housing area traffic would be expected. Long-term beneficial effects would also be expected from roadway changes made during housing development. Simpson Drive would become a cul-de-sac and Crowell Cricle and Tripp Drive would be removed. These changes would reduce pass-through traffic in the housing areas. Other aspects of the CDMP also would help create a more pedestrian-friendly environment.

4.10.2.2 No Action Alternative

No effects on transportation resources would be expected because there would be no change to the current housing inventory or road network.

4.11 UTILITIES

4.11.1 Affected Environment

Utility Systems. All housing areas within the RCI footprint have full utilities services. Natural gas, electric, and wastewater systems on the installation have been privatized. Privatization of the potable water system is currently being negotiated. Currently, the installation supplies its own

water from two water purification plants; the source of the water is the Tennessee River. The Knology cable company is the primary provider of cable television and cable internet. Bell South provides the telephone infrastructure for phone communications on Redstone Arsenal. Bell South also provides, as do other private companies, phone communications to residents on Redstone Arsenal (Department of the Army, 2004).

Storm water. Storm water from the footprint is discharged to McDonald Creek through a system of storm drains that serves all family housing areas.

Landfills and Solid Waste. Redstone Arsenal has a landfill that accepts construction and demolition (C&D) debris, and the landfill can accept up to 300 tons of debris per day (Hewitt, 2005). Trash and other household solid waste are collected by a private contractor and disposed of off post. A household recycling program, also operated by a private contractor, is available to residents and employees for recycling newspaper, magazines, cans, motor oil, and plastics (Hewitt, 2004). By fiscal year 2007, however, the garrison recycling program will no longer pay the current contractor for the curbside recycling program (Hewitt, 2005).

4.11.2 Consequences

4.11.2.1 Proposed Action

Utility Systems. Long-term beneficial effects on utility systems would be expected. Under the proposed action, the number of housing units would decrease while the on-post population would not be affected. Utility demand for residential use, therefore, would be expected to decrease over the long-term. Renovation of many units with energy-efficient appliances and low-flow water fixtures, and installation of the same in new units, could reduce the demand on utilities from baseline levels. All new connections to existing utilities systems would be made by RAFH in accordance with applicable building codes. All utilities have sufficient capacity to handle any increased demand during the construction phase of the project.

Storm water. No effects would be expected.

Landfills and Solid Waste. Long-term minor adverse effects on landfills would be expected. The installation landfill could adequately handle the C&D debris from the proposed demolition and renovation during the initial 30-month development period of the RCI project. RAFH could also choose to use an off-post landfill with sufficient capacity for disposal of the C&D debris. Nevertheless, disposal of debris from the RCI project would reduce the available volume of the chosen landfill for other purposes. If the Redstone landfill was chosen for disposal of the RCI C&D debris, it is possible that there would not be sufficient space in the landfill for any houses demolished during the 17th to 18th years of the project. In that case, the debris from those later demolitions would be disposed of off the installation. See Appendix E for an estimate of the quantity of C&D debris that would be generated by the proposed action.

No effects on the quantity of solid waste generated by family housing residents would be anticipated from the discontinuation of support for the current household recycling program. It is anticipated that RAFH would continue the program with the current or another contractor.

4.11.2.2 No Action Alternative

No effects would be expected. No changes to utilities systems connections or demands would occur under the no action alternative, and no construction debris would be generated.

4.12 HAZARDOUS AND TOXIC MATERIAL

4.12.1 Affected Environment

Specific environmental statutes and regulations govern hazardous material and hazardous waste management activities at Redstone Arsenal. For the purpose of this analysis, the terms *hazardous waste*, *hazardous materials*, and *toxic substances* include those substances defined as hazardous

by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), the Resource Conservation and Recovery Act (RCRA), or the Toxic Substances Control Act (TSCA). In general, they include substances that, because of their quantity, concentration, or physical, chemical, or toxic characteristics, might present substantial danger to public health or welfare or the environment when released into the environment.

To identify areas where possible storage, release, or disposal of hazardous substances or petroleum products or their derivatives has occurred, the Army, through contractor support, prepared an Environmental Baseline Survey (EBS) of those areas at Redstone Arsenal considered for RCI project development (Tetra Tech, 2004). The EBS also identified any existing non-CERCLA-related environmental or safety issues (e.g., asbestos-containing materials [ACM] and lead-based paint [LBP]) that would limit or preclude use of the property for RCI actions. A summary of the findings contained in the EBS is included in the following sections.

4.12.1.1 Uses of Hazardous Materials

Previous investigations have identified hazardous substances present in housing units on Redstone Arsenal. Although these materials are now known to be hazardous, they were widely used in the building products industry and for housing maintenance for many years. Their presence in the housing units does not constitute a health hazard under normal circumstances, and the materials are being removed or encapsulated as the units are renovated. These hazardous materials include ACM, LBP, and pesticides. ACM includes tile floor covering and floor mastic. LBP was identified on interior and exterior surfaces, including windows and doors. The pesticide chlordane was used on the installation before it was banned by the U.S. Environmental Protection Agency (USEPA). The presence of ACM, LBP, and pesticides in the family housing areas is discussed in greater detail in Section 4.12.1.5, Special Hazards.

Numerous maintenance activities require the use and storage of regulated and unregulated hazardous materials. Examples of such activities are vehicle operation and maintenance, hospital services, and grounds maintenance. The family housing operation and maintenance department uses a wide variety of chemicals (typically in small quantities), including hazardous materials, in and around family housing and ancillary supporting facilities. Examples of these chemicals are paint, pesticides, herbicides, and cleaning solvents. Specially trained contractor staff apply pesticides to common facilities and to individual housing units as requested. Residents are allowed to use commercial off-the-shelf products as necessary. No estimates are available on the locations, volumes, extent, strength, persistence, or toxicity of materials applied by residents.

4.12.1.2 Storage and Handling Areas

In 1999 there were 61 active unregulated underground storage tanks (USTs) and 8 ADEM-registered USTs on the installation. Nine other inactive USTs were removed in early 1998 (Davis, 1999, as cited in SMC and IERA, 2000). The eight registered USTs store gasoline, aviation gasoline, diesel, and used oil. The unregulated tanks store heating oil (SMC and IERA, 2000). There are no active or inactive USTs or aboveground storage tanks (ASTs) within or adjacent to the footprint property (Souza, personal communication, 2004). There are no reported petroleum product spills or releases within or adjacent to the RCI footprint. No hazardous materials are stored within the RCI footprint. Materials that could pose an environmental concern include paints, solvents, detergents, and pesticides (see Section 4.12.1.5, Special Hazards).

4.12.1.3 Hazardous Waste Disposal

A number of hazardous wastes, as defined by RCRA, are generated from the normal operations of Army programs at Redstone Arsenal. Redstone is a large-quantity generator of hazardous waste. The installation generated approximately 135,000 pounds of hazardous waste in 2003, which primarily consisted of petroleum products, solvents, adhesives, paints, photographic waste, and waste antifreeze (Seaver, personal communication, 2004). All hazardous wastes are stored and managed in accordance with local, state, and federal regulations. To facilitate the disposal of

hazardous waste/material, several 90-day storage areas and RCRA-permitted storage areas are located across the installation for hazardous waste storage. The Defense Reutilization and Marketing Office has a contract with a private contractor to transport the hazardous waste to an off-site RCRA-permitted treatment, storage, and disposal facility for ultimate disposal. No hazardous wastes are stored within or adjacent to the RCI footprint (Seaver, personal communication, 2004). No hazardous waste storage or disposal sites were evident during the visual inspection of the footprint property performed for the EBS.

4.12.1.4 Site Contamination and Cleanup

There are 395 contaminated sites at Redstone Arsenal. Of the 395 sites, the Army has responsibility of 305 sites, including the five Olin Chemical Corporation DDT sites, and NASA is responsible for 90 sites. One hundred-fifty three of the Army sites are being managed under the Installation Restoration Program (IRP) and 147 are being managed under Compliance Cleanup. Of the 153 Army IRP sites, 128 are being actively investigated, six are response complete, 13 have been combined with another site that is being actively investigated, and six are being reviewed for IRP eligibility (Draft RSA IR IAP 2005). The IRP sites include burn areas, landfills, storage areas, sewage treatment plants, UST sites, waste treatment plants, surface disposal areas, building demolition sites, incinerators, oil/water separators, surface impoundments and lagoons, spill site areas, AST sites, waste line sites, unexploded munitions/ordnance sites, contaminated sediments, chemical disposal sites, industrial discharge sites, and other miscellaneous sites. The primary contaminants of concern are chlorinated solvents, pesticides, metals, chemical warfare materials, and unexploded ordnance (Shaw, 2003). Groundwater restrictions may be necessary to prohibit the use of groundwater including the installation of wells and groundwater withdrawal. No contaminated sites were evident during the visual inspection of the footprint property.

None of the sites are in the footprint. One site is adjacent to the southeast corner of the footprint. That site is an UST spill site near the intersection of Goss Road and Vincent Drive, east of Building 3240 (a service station). The leaking tanks, associated piping, and contaminated soils were removed, but a groundwater plume that extends under the footprint property remains. The groundwater is contaminated with lead, methyl tertiary butyl ether (commonly referred to as MTBE), benzene, toluene, ethylbenzene, and xylenes. A preliminary assessment/site investigation, remedial investigation/feasibility study, and remedial design have been completed for the site. The installation is implementing a remediation program for the plume (Shaw, 2003).

4.12.1.5 Special Hazards

Asbestos. EPA and the Occupational Safety and Health Administration (OSHA) regulate remediation for ACM. Asbestos fiber emissions into the ambient air are regulated in accordance with Section 112 of the Clean Air Act, which established the National Emissions Standards for Hazardous Air Pollutants. These standards address demolition or renovation of buildings with ACM. All ACM subject to disturbance in such projects must be abated by trained and qualified asbestos personnel before a work order is turned over to maintenance personnel or a general contractor. Redstone Arsenal has established policies and procedures for the safe and proper operational procedures and responsibilities for handling, removing, and disposing of ACM.

The family housing at Redstone Arsenal was constructed from 1957 to 2003. Of the 459 housing units, 218 were constructed from 1957 to 1972. Redstone Arsenal conducted asbestos sampling in the housing areas from 1988 to 1997 (Souza, personal communication, 2004). Many of the housing units were found to contain asbestos. Asbestos was determined to be present primarily in floor tile, linoleum floor covering, roll floor covering, floor mastic, duct insulation, and duct mastic (Redstone Arsenal, 2003a). ACM is abated during renovation activities.

PCBs. Polychlorinated biphenyls (PCBs) are industrial compounds used in electrical equipment, primarily capacitors and transformers, because they are electrically nonconductive and remain stable at high temperatures. Because of their chemical stability, PCBs persist in the environment,

bioaccumulate in organisms, and become concentrated in the food chain. The disposal of PCBs is regulated by TSCA, which regulates the removal and disposal of contaminated equipment containing PCBs at concentrations greater than 50 parts per million (ppm).

Redstone Arsenal surveyed all large transformers for PCBs in 1975. All large transformers containing PCBs were removed and disposed of in accordance with applicable regulations. EPA has allowed Redstone Arsenal to test pole-mounted transformers for PCBs as they are taken out of service. Transformers determined to contain less than 50 ppm PCBs are sold through the Defense Reutilization and Marketing Office. Transformers determined to contain more than 50 ppm PCBs are disposed of by a PCB disposal contractor at an approved disposal facility (SMC and IERA, 2000). Four in-service transformers in the footprint have been determined to contain greater than 50 ppm PCBs (Redstone Arsenal, 2004). There have been no known spills or releases of PCBs in the footprint.

Lead-Based Paint. Current Army policy calls for controlling LBP by using in-place management rather than mandated removal procedures. In-place management is used to prevent deterioration over time of those surfaces likely to contain LBP, followed by replacement as necessary. Maintenance staff and residents are given instructions on routine cleaning procedures to capture LBP fragments from suspected locations. Under U.S. Army Engineering and Housing Support Center Technical Note 420-70-2 (*Lead-Based Paint: Hazard Identification and Abatement*), major renovation and unit demolition would require that LBP be removed from the housing units. LBP would be encapsulated and removed in accordance with Army, Housing and Urban Development, and OSHA guidelines, which cover contractor training, notification requirements, use of personal protective equipment, and approved disposal methods. In addition, as individual quarters were leased, RAFH would ensure that the Army's LBP pamphlet was issued to housing occupants, when applicable, to notify them of the potential risk.

Redstone Arsenal conducted LBP sampling in the housing areas from 1995 to 2001 (Souza, personal communication, 2004). Test results indicated the presence of LBP on many of the housing units constructed from 1957 to 1972. LBP was most commonly found on painted wood surfaces such as windows and doors. The installation has implemented an LBP abatement program that requires replacing windows and doors that have LBP or encapsulating the LBP. Visual surveys conducted during development of the EBS identified paint chips on the ground surface adjacent to eight buildings. To date, there have been no surveys to determine the lead levels in soil in the housing areas. According to TSCA Section 403, a soil-lead hazard is present on residential property or at a child-occupied facility when concentrations in the soil exceed 400 ppm or 1,200 ppm of bare soil in the rest of the yard (non-play areas). Testing would be necessary to determine whether lead is present in soils above action levels.

Pesticides. Redstone Arsenal has implemented a Pest Management Plan. With the exception of the golf course, all pesticide applied on the installation grounds are handled by a contractor. Trained installation personnel handle pesticides application to the golf course. The installation support contractor administers the self-help program for family housing. A contractor conducts pest control in the family housing, other than self-help (Redstone Arsenal, 2002b). Only substances approved by USEPA, the state of Alabama, and the U.S. Army Environmental Center are used as part of Redstone Arsenal's pest control program, and all substances are used in accordance with USEPA's recommendations (Horton, personal communication, 2004).

Chlordane might have been used in the housing areas USEPA's ban on its use. Chlordane is generally not considered to be a hazardous waste, however, if it was applied for its intended use as a pesticide, as opposed to storage, disposal as waste material, or migration to its current location from the application site. Although this pesticide is not considered a hazardous waste as defined by the Solid Waste Disposal Act, materials leaching chlordane at concentrations greater than 0.03 milligram per liter upon excavation are defined as hazardous by the Toxic Characteristic under RCRA and must be dealt with accordingly.

Radon. Radon is a gaseous radioactive element that occurs by the decay of radium associated with the breakdown of minerals in the earth. Radon can be found in high concentrations in soils and rocks containing uranium, granite, shale, and phosphate. Atmospheric radon is diluted to insignificant levels; however, when concentrated in enclosed areas, radon can present human health risks.

A radon survey was conducted in 23 housing units in 2001. Test results indicated that radon levels exceeded the USEPA action guidelines of 4 picocuries per liter (pCi/L) in seven housing units (281, 284, 317, 405, 417, 425, and 453). Long-term monitoring results conducted in 2001 for the same housing units indicated that radon levels exceeded four pCi/L in 4 housing units. Subsequent monitoring, conducted in 2002, indicated no exceedance of the USEPA action levels (Tetra Tech, 2004).

Radioactive Materials. Available evidence suggests that no radioactive materials have ever been used or stored in the RCI footprint (Tetra Tech, 2004).

Medical/Biohazardous Waste and Silver Recovery. Available evidence suggests that no medical, biological, or silver recovery wastes have ever been used or stored in the RCI footprint (Tetra Tech, 2004).

Mold. Mold spores continuously migrate through indoor and outdoor air, and they can grow and reproduce on wood, paper, carpet, and foods. When excessive moisture or water accumulates indoors, mold growth often occurs, particularly if the moisture problem remains undiscovered or unaddressed. Moisture problems in buildings can be caused by a variety of conditions, including roof and plumbing leaks, condensation, and excess humidity. Some of the potential effects and symptoms associated with mold exposure are allergic reactions, asthma, and other respiratory complaints. Five residential units on Redstone Arsenal were found to contain areas where minor mold growth was present. The mold was most commonly found on exterior building walls (Tetra Tech, 2004).

4.12.2 Consequences

4.12.2.1 Proposed Action

Long-term minor beneficial effects would be expected. ACM and LBP present in existing housing units at Redstone Arsenal would be handled in a manner consistent with applicable rules and regulations, and thus no environmental or health effects resulting from the removal, handling, and disposal of these materials would be expected. There would be an overall reduction in ACM and LBP in residential areas. The actual and potential ACM and interior and exterior LBP would be removed from post housing units or encapsulated during demolition or renovation activities.

No environmental or health effects resulting from the removal, handling, and disposal of hazardous materials would be expected during demolition or renovation activities. Before construction, demolition, or renovation activities, a soil analysis would be conducted for the presence of lead levels that exceed 400 ppm to determine whether soil abatement or application of additional layers of clean topsoil was necessary. Before initiating renovation activities, RAFH would evaluate the potential environmental impacts of ACM, LBP, household hazardous materials, and general renovation debris and would address them as specified in the appropriate regulatory requirements. RAFH would also evaluate demolition that involves LBP for compliance with Army Engineering and Housing Support Center Technical Note 420-70-2 and the OSHA Standard at 29 CFR 1926.62 and implement measures to control airborne asbestos and lead dust. In addition, RAFH would ensure that housing occupants would receive an LBP pamphlet notifying them of the potential risk as individual quarters were leased.

No effects from pesticide use would be expected. Pesticides, including chlordane, present in soils of lawns and housing units are not considered hazardous waste if used as a product at their current location for the intended use, as opposed to having been stored, disposed of as waste material, or allowed to migrate to their current location from the site of application.

Additional potentially hazardous materials that could be found on-site during RCI project-related activities include paints, asphalt, and fuel and motor oils for construction vehicles and equipment. The construction contractors would be responsible for preventing or responding to paint and fuel spills.

No effects would be expected from hazardous waste disposal. The current hazardous waste disposal procedures would continue with implementation of the proposed action.

No effects from radon and mold would be expected with implementation of the proposed action.

4.12.2.2 No Action Alternative

Long-term minor adverse effects could occur. Because of the extensive maintenance backlog and budget constraints, housing units might contain special hazards such as LBP and ACM. Redstone Arsenal would continue to abate these potential hazards in accordance with applicable laws, but abatement would extend over a much longer period than that under the proposed action, thereby increasing the possibility of exposure.

4.13 CUMULATIVE EFFECTS SUMMARY

Cumulative effects are defined by CEQ in 40 CFR 1508.7 as the "impacts on the environment which result from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or nonfederal) or person undertakes such other actions."

Non-RCI construction projects proposed on Redstone Arsenal that are in the vicinity of the RCI footprint would be the primary source of cumulative effects. Cumulative effects on air quality, noise, and traffic would be expected. Because effects caused by construction projects are short-lived and generally confined to a small area surrounding the projects, none of the effects would be expected to be significant. Appropriate mitigation measures, discussed below, would be used to reduce or avoid cumulative effects.

4.14 MITIGATION SUMMARY

Mitigation measures for the proposed Army RCI project will be incorporated into the CDMP. Such measures would be expected to reduce, avoid, or compensate for most adverse effects. Table 4-9 summarizes the proposed mitigation measures to be taken for each of the affected resources.

Table 4-9
Summary of Mitigation Measures

Land Use
• Adhere to guidelines outlined in the Redstone Arsenal Real Property Master Plan when renovating housing areas. • Coordinate site planning for the new housing units with the design of other proposed construction projects in the vicinity of the RCI footprint to minimize potential adverse effects on both on- and off-post residents.
Aesthetics and Visual Resources
• Design housing units in a regionally appropriate architectural style. • Revegetate housing areas with native vegetation. • Maintain trees and native vegetation wherever possible. • Place new utility lines underground to improve aesthetics.
Air Quality
• Spray water on work sites to reduce fugitive dust emissions.
Noise
• Limit construction activities to daylight hours. • Consider the incorporation of tree buffers or other noise-attenuating measures into community designs to separate noise-producing land uses from housing areas.
Geology and Soils
• Avoid construction near existing sinkholes. Perform site evaluations for potential sinkholes. Implement remedial actions, such as filling or plugging, if necessary. • Use state-recommended BMPs to minimize soil erosion and sedimentation in surface waters.
Water Resources
• Implement state-recommended BMPs to control soil erosion and runoff. • Implement a SWPPP. • Reseed and revegetate area following construction activities to minimize sedimentation.
Biological Resources
• Implement RCI guidelines to preserve natural features in new housing developments and landscape yards and roadsides with native vegetation. • Obtain and implement all requirements of a U.S. Army Corps of Engineers wetland permit if wetlands are disturbed, including any required mitigation actions.
Cultural Resources
• No mitigation measures would be necessary for cultural resources. Should any cultural resources be found during development, procedures in the installation Integrated Cultural Resources Management Plan would be adhered to.
Socioeconomics and Protection of Children
• Secure construction vehicles and equipment when not in use. • Place barriers and "no trespassing" signs around construction sites where practicable. • Avoid the use of building products containing hazardous materials.
Traffic and Transportation
• Route and schedule all RCI construction vehicle traffic to minimize traffic delays and congestion. • Locate construction material staging areas to minimize traffic impacts. • Incorporate traffic-calming measures in the vicinity of housing. • Incorporate overall design improvements, such as walkways and bicycle paths, to reduce reliance on vehicles and to create more connected, pedestrian-friendly communities.

Table 4-9
Summary of Mitigation Measures (cont.)

Utilities
Potable Water
• No mitigation is necessary; however, install water-efficient control devices, such as low-flow showerheads, faucets, and toilets, in all new facilities.
Energy
• No mitigation is necessary; however, install energy-efficient interior and exterior lighting fixtures and controls in all new units. All new units would be built to EnergyStar energy efficiency standards.
Recycling
• No mitigation is necessary; however, household commodities (e.g., newspaper, magazines, alkaline batteries, used motor oil, aluminum and steel cans, and plastic bottles and jugs) shall be collected as part of the RAFH residential curbside recycling program.
Hazardous and Toxic Substances
• Before initiating renovation activities, evaluate environmental impacts and address in accordance with the appropriate regulatory requirements.
• Implement measures to control airborne asbestos and lead dust.
• Conduct lead-in-soil testing before construction activities and address in accordance with regulatory requirements.
• Perform evaluation and disposal of excavated soils contaminated with lead, pesticides/chlordane, and hazardous materials in accordance with applicable regulations.
• Perform evaluation and disposal of demolition materials in accordance with applicable regulations at the time of demolition.
• Establish smoking areas and prohibit open flames near flammable materials.
• Use proper storage and handling, paying attention to tasks at hand, and responsible driving.

SECTION 5.0

FINDINGS AND CONCLUSIONS

This EA has been prepared to evaluate the potential effects on the natural and human environment from activities associated with implementation of the Army RCI program at Redstone Arsenal. The EA has examined the Army's preferred alternative (implementation of the CDMP negotiated with Redstone Arsenal) and the no action alternative.

The EA has evaluated potential effects on land use, aesthetic and visual resources, air quality, noise, geology and soils, water resources, biological resources, cultural resources, socioeconomics (including environmental justice and protection of children), transportation, utilities, and hazardous and toxic substances.

5.1 FINDINGS

The evaluation of the proposed action, identified as the Army's preferred alternative, indicates that the physical and socioeconomic environments at Redstone Arsenal and in the ROI would not be significantly affected. The RCI footprint at Redstone Arsenal was not found to present physical or environmental constraints to developing the proposed property; any constraints found during the development process would be dealt with by the development entity, RAFH, to avoid, minimize, or mitigate potential adverse effects so that only minor effects on the human and natural environment would result. The predicted consequences on resource areas are briefly described below. Table 5-1 provides a summary and comparison of the consequences of the proposed action versus the no action alternative.

5.1.1 Consequences of the Proposed Action

5.1.1.1 Land Use

Long-term minor beneficial effects on installation land use would be expected. No land use incompatibilities would be expected because no housing construction is planned for areas outside existing housing areas. RAFH would increase buffer space around the family housing by eliminating Housing Area 1 and the easternmost portions of Area 6. This would be beneficial by helping to separate housing from other land uses, as well as help interconnect the neighborhoods to create more cohesive communities.

No effects on surrounding land use would be expected.

5.1.1.2 Aesthetic and Visual Resources

Short-term minor adverse and long-term moderate beneficial effects would be expected. Construction activities are inherently displeasing aesthetically. During the construction and renovation phase of the RCI program, vistas from various vantage points on the installation would be intruded upon by construction equipment, construction material staging areas, and bare land dotted with buildings undergoing construction or demolition. These effects, however, would be short-term and localized to the areas under construction.

Beneficial effects would also be expected from implementing the CDMP. Manifestation of the CDMP developed by RAFH would achieve aesthetically harmonious communities through the use of cohesive and regionally appropriate architectural design characteristics, landscape planning that focuses on using native plant species and screening visually intrusive structures and activities, and the inclusion of green space. As a result of the RCI, the overall aesthetic appeal of the housing areas would be greatly improved.

Table 5-1.
Summary of Potential Environmental and Socioeconomic Consequences

	Environmental and Socioeconomic Consequences	
Resource Area	**Proposed Action**	**No Action Alternative**
Land Use	Long-term minor beneficial	No effects
Aesthetic and Visual	Short-term minor adverse Long-term moderate beneficial	Long-term minor adverse
Air Quality	Short-term minor adverse	No effects
Noise	Short-term minor adverse Long-term minor beneficial	No effects
Geology and Soils		
• Topography	No effects	No effects
• Geology	No effects	No effects
• Soils	Short-term minor adverse	No effects
• Prime farmland	No effects	No effects
Water Resources		
• Surface water	Short-term negligible adverse	No effects
• Groundwater	No effects	No effects
• Floodplains	No effects	No effects
Biological Resources		
• Vegetation and wildlife	Short- and long-term negligible adverse	No effects
• Listed species	No effects	No effects
• Wetlands	Short-term negligible indirect adverse	No effects
Cultural Resources	No effects	No effects
Socioeconomics		
• Economic development and demographics	Short-term minor beneficial	No effects
• Housing and quality of life	Long-term major beneficial	Long-term minor adverse
• Other quality of life	Short- and long-term minor adverse Long-term moderate beneficial	No effects
• Environmental justice	No effects	No effects
• Protection of children	Short-term minor adverse Long-term minor beneficial	Long-term minor adverse
Transportation	Short-term minor adverse Long-term minor beneficial	No effects
Utilities		
• Utility systems	Long-term beneficial	No effects
• Storm water	No effects	No effects
• Landfills	Long-term minor adverse on	No effects

	landfills	
Hazardous and Toxic Substances	Long-term minor beneficial	Long-term minor adverse

5.1.1.3 Air Quality

Short-term minor adverse effects would be expected. Construction equipment would generate air pollutants in addition to those already emitted at the installation. Because the installation is in an area that is in attainment for all criteria pollutants, a general conformity review is not required.

5.1.1.4 Noise

Short-term minor adverse and long-term minor beneficial effects on noise levels in the housing areas would be expected. Implementation of the proposed action would result in noise exposure during the construction phase due to the operation of construction equipment and construction activities in general. Long-term benefits would be realized by removing housing from Housing Areas 1 and 6, the conversion of the vacated areas to green space, and adding additional green space in other areas of the footprint.

5.1.1.5 Geology and Soils

Topography. No effects on topography would be expected.

Geology. No effects would be expected. Housing construction would occur only on previously developed areas. Sinkholes, therefore, would not be expected to be a construction issue. If a sinkhole were found, remedial action in accordance with Redstone Arsenal procedures would be taken.

Soils. Short-term minor adverse effects would be expected. In the short term, soil erosion would likely result from ground disturbance by construction equipment.

Prime Farmland. No effects would be expected.

5.1.1.6 Water Resources

Surface Water. Short-term negligible adverse effects on surface waters would be expected. Erosion following soil-disturbing construction activities could lead to a short-term increase in surface runoff to McDonald Creek.

Groundwater. No effects on groundwater resources would be expected.

Floodplains. No effects would be expected.

5.1.1.7 Biological Resources

Short- and long-term negligible adverse effects on vegetation and wildlife would be expected. Vegetation and wildlife habitat within the RCI footprint are highly disturbed except for some forest edges on the periphery. Landscaping vegetation in existing housing areas could be damaged or removed during the RCI project. New landscaping using native species, however, would be planted following construction. Common wildlife species habituated to human presence would be expected to be displaced during housing construction and to return after the construction was completed. No

impacts on federally or state-listed threatened or endangered species or species of concern would be expected because these species are not present in or adjacent to the RCI footprint.

Short-term negligible indirect adverse effects on wetlands would be expected. Wetland areas near Housing Areas 1, 6, and 10a would not be directly affected by the RCI program, though an indirect effect as sediment runoff from construction areas could occur. If required, RAFH would obtain a U.S. Army Corps of Engineers Section 404 permit and the permit would specify any required compensatory mitigation.

5.1.1.8 Cultural Resources

No effects on cultural resources would be expected from implementation of the proposed action. If unknown deposits or remains were to be discovered during construction, activities would cease until the appropriate installation personnel, as well as the Alabama SHPO, were contacted and a determination was made regarding the NRHP eligibility of the site. If NRHP-eligible, the sites would be treated in accordance with procedures outlined in the ICRMP and in consultation with the Alabama SHPO, which would help ensure their preservation. No cemeteries within the RCI footprint would be expected to be affected.

5.1.1.9 Socioeconomics

Economic development and demographics. Short-term direct and indirect minor beneficial effects would be expected. The expenditures associated with demolition, construction, and renovation of family housing units and associated facilities at Redstone Arsenal would increase sales volume, employment, and income in the ROI, as determined by the EIFS model. The action would create about 135 jobs, increase income by more than $4 million, and business sales by about $18 million. The economic benefits would be short-term, lasting only for the duration of the development period. These changes in sales volume, employment, and income would fall within historical fluctuations (i.e., within the RTV range) and be considered minor. No change in ROI population would be expected. Soldiers would move from off-post to on-post housing, but no change in the number of soldiers stationed at Redstone Arsenal would occur under the proposed action.

Housing. Long-term major direct beneficial effects on on-post family housing would be expected. Implementing the RCI at Redstone Arsenal would ensure that eligible soldiers and their families would have access to quality, attractive, and affordable housing. The proposed action would improve the condition and aesthetic appeal of on-post family housing through revitalization of existing units and construction of new units. The rent for the new and revitalized housing would not exceed a soldier's BAH.

Quality of life. Short-term direct minor adverse and long-term direct beneficial effects on quality of life would be expected. In the short term, noise and traffic from construction of RCI housing could be disruptive to the existing residents. In the long term, however, overall quality of life for soldiers and their families would be greatly improved through implementation of the RCI at Redstone Arsenal because of the improved condition of on-post family housing, as well as the overall residential community. The proposed action would improve the condition and aesthetic appeal of existing housing through revitalization and construction of new housing, and it would heighten the sense of community through improved and linked open spaces, trail systems to connect neighborhoods, and community centers. The following paragraphs identify the foreseen effects for each of the key components of quality of life.

Law Enforcement and Fire Protection. No effects on law enforcement or fire protection services would be expected. Although the housing units would be sold to the developer, the land on which the buildings stand would only be leased to the developer (i.e., the land would continue to be federal government property). Therefore, Redstone Arsenal would retain legislative jurisdiction. The MP and the installation's fire department would still respond to emergencies in the family housing areas. In addition, because the number of on-post family housing units would not increase, no effects on the demand for law enforcement or fire protection services would be expected to result from implementation of the proposed action.

Medical Services. No effects on medical services would be expected. Implementation of the RCI would not change the eligible population of active duty military, military dependents, or retirees in the region serviced by on-post and civilian facilities.

Schools. Long-term minor adverse effects would be expected. The proposed action would reduce the number of family housing units on-post by 229 units. More families would live off-post. Because schools receive a lower level of federal impact aid for children living off-post, federal impact aid to schools would decrease.

Family Support Services. No effects on family services would be expected. The eligible population of active duty military, dependents, and retirees in the region would not change.

Shops and Services. No effects on shops and services would be expected. The eligible population of active duty military, dependents, and retirees in the region would not change.

Recreation. Long-term beneficial effects would be expected to result from implementation of the proposed action. The RCI could also include additional ancillary supporting facilities, such as walking trails, parks, recreation areas, and community centers. Along with the existing facilities that already serve Redstone Arsenal residents, these additional facilities would accommodate the new housing areas and improve recreational opportunities throughout the housing developments.

Environmental justice. No effects would be expected. Implementation of RCI would not result in disproportionate adverse environmental or health effects on low-income or minority populations.

Protection of children. Short-term minor adverse and long-term beneficial effects on the protection of children would be expected. In the short term, because construction sites can be enticing to children, construction activity could be an increased safety risk. During construction, safety measures stated in 29 CFR Part 1926, Safety and Health Regulations for Construction, and AR 385-10, Army Safety Program, would be followed to protect the health and safety of residents on Redstone Arsenal, as well as construction workers. Barriers and "no trespassing" signs would be placed around construction sites to deter children from playing in those areas, and construction vehicles and equipment would be secured when not in use.

Long-term beneficial effects on children would be expected because of reduced exposure to hazardous materials. Hazardous materials (including asbestos-containing materials and lead-based paint) identified in Redstone Arsenal housing units would be abated through removal or encapsulation during renovation or demolition activities. New construction would not use building products containing hazardous materials. These actions would eliminate children's possible exposure to such hazardous materials in on-post family housing.

5.1.1.10 Transportation

Short-term minor adverse and long-term minor beneficial effects on transportation would be expected. During RCI construction and renovation, traffic congestion could increase from the addition of construction vehicles, particularly during rush hours. Construction vehicles also would likely increase wear and tear on installation roads. Some roads might require additional maintenance and road closures to accommodate utility construction and installation would be expected and would create short-term traffic delays.

Because of the long-term reduction in housing inventory, long-term beneficial effects on housing area traffic would be expected. Long-term beneficial effects would also be expected from roadway changes made during housing development. Simpson Drive would become a cul-de-sac and Crowell Cricle and Tripp Drive would be removed. These changes would reduce pass-through traffic in the housing areas.

5.1.1.11 Utilities

Utility Systems. Long-term beneficial effects on utility systems would be expected. Under the proposed action, the number of housing units would decrease while the on-post population would not be affected. Utility demand for residential use, therefore, would be expected to decrease over the long-term. Renovation of many units with energy-efficient appliances and low-flow water fixtures, and installation of the same in new units, could reduce the demand on utilities from baseline levels. All utilities have sufficient capacity to handle any increased demand during the construction phase of the project.

Storm water. No effects would be expected.

Landfills and Solid Waste. Long-term minor adverse effects on landfills would be expected. The installation landfill could adequately handle the C&D debris from the proposed demolition and renovation during the initial 30-month development period of the RCI project. RAFH could also choose to use an off-post landfill with sufficient capacity for disposal of the C&D debris. Nevertheless, disposal of debris from the RCI project would reduce the available volume of the chosen landfill for other purposes. If the Redstone landfill was chosen for disposal of the RCI C&D debris, it is possible that there would not be sufficient space in the landfill for any houses demolished during the 17th to 18th years of the project. In that case, the debris from those later demolitions would be disposed of off the installation.

No effects on the quantity of solid waste generated by family housing residents would be anticipated from the discontinuation of support for the current household recycling program. It is anticipated that RAFH would continue the program with the current or another contractor.

5.1.1.12 Hazardous and Toxic Substances

Long-term minor beneficial effects would be expected. ACM and LBP present in existing housing units at Redstone Arsenal would be handled in a manner consistent with applicable rules and regulations, and thus no environmental or health effects resulting from the removal, handling, and disposal of these materials would be expected. There would be an overall reduction in ACM and LBP in residential areas. The actual and potential ACM and interior and exterior LBP would be removed from post housing units or encapsulated during demolition or renovation activities.

No environmental or health effects would be expected to result from the removal, handling, and disposal of hazardous materials during demolition or renovation activities, from pesticide use, from hazardous waste disposal, or from radon and mold.

5.1.1.13 Cumulative Effects

Non-RCI construction projects proposed on Redstone Arsenal that are in the vicinity of the RCI footprint would be the primary source of cumulative effects. Cumulative effects on air quality, noise, and traffic would be expected. Because effects caused by construction projects are short-lived and generally confined to a small area surrounding the projects, none of the effects would be expected to be significant.

5.1.1.14 Mitigation Measures

Mitigation actions would be expected to reduce, avoid, or compensate for most adverse effects. Refer to Table 4-9 in Section 4.14 for a summary of proposed mitigation measures.

5.1.2 Consequences of the No Action Alternative

Only those resources that would be affected by the no action alternative are discussed below.

5.1.2.1 Aesthetics and Visual Resources

Long-term minor adverse effects would be expected. Under the no action alternative, the Army would continue to be responsible for maintenance and renovation of existing housing and for new housing construction as necessary. Lack of sufficient funding for this work and the existence of an extensive backlog of work indicate that housing overall would deteriorate over time. Such deterioration would be expected to adversely affect the visual and aesthetic quality of the housing areas.

5.1.2.2 Socioeconomics

Housing and quality of life. Long-term minor adverse effects would be expected. Continuation of current family housing programs would perpetuate deficiencies in quality of life for soldiers and their dependents. The availability of affordable, quality family housing is a key factor in quality of life and is often given high priority by soldiers and their families. The Army would continue to do regular maintenance on existing housing, as well as some renovation and demolition, but it would be on a constrained budget over approximately a 30-year period, compared to the 10-year period under the proposed action. Over the 30 years, some housing units would deteriorate, becoming unsuitable for occupancy. This would decrease the inventory of family housing on Redstone Arsenal, forcing military employees and their families to find off-post housing. Depending on the person's rank and number of dependents, he or she could pay more than the MAHC for off-post housing that meets the family's needs.

Protection of children. Long-term minor adverse effects on the protection of children would be expected. Under current conditions the hazardous materials identified in on-post housing units are not health hazards because they have been contained or removed. As homes would deteriorate, however, the risk of children's exposure to hazardous materials (such as chipping lead-based paint or cracked asbestos-containing tiles) would increase.

5.1.2.3 Hazardous and Toxic Substances

Long-term minor adverse effects could occur. Because of the extensive maintenance backlog and budget constraints, housing units might contain special hazards such as LBP and ACM. Redstone Arsenal would continue to abate these potential hazards in accordance with applicable laws, but abatement would extend over a much longer period than that under the proposed action, thereby increasing the possibility of exposure.

5.1.2.4 Cumulative Effects

No cumulative effects would be expected to result from implementation of the no action alternative.

5.2 CONCLUSIONS

Based on the analysis performed in this EA, implementation of the preferred alternative would have no significant direct, indirect, or cumulative effects on the quality of the natural or human environment. Preparation of an Environmental Impact Statement is not required. Issuance of a FNSI would be appropriate.

SECTION 6.0
REFERENCES

ADEM (Alabama Department of Environmental Management). 2004. *Construction Permitting Requirements.* http://www.adem.state.al.us/FieldOps/Permitting/Construction/ Construction.htm. Accessed June 15, 2004.

ADEQ (Alabama Department of Environmental Quality). 2002. Draft FY 2002 303(d) List.

Alabama DIR (Department of Industrial Relations). 2003. *Alabama Labor Market Information*. http://www2.dir.state.al.us/LAUS/LAUS.asp. Accessed September 26, 2003.

ALAHA (Alabama Hospital Association). 2003. *Alabama Hospitals*. http://www.alaha.org/ default.html. Accessed September 25, 2003.

Alexander, L.S., H.R. Campbell, D.J. Minnich, and J.M. Moore. 1998. *Phase 1 Archeological Survey of Ground Disturbance Areas 4, 5, and 7 on Redstone Arsenal, Madison County, Alabama*. Vols. I and II. AHC 99-0223. Alexander Archeological Consultants, Wildwood, Georgia. November.

Chamber of Commerce of Huntsville/Madison County. 1999. *1999 Guide to Huntsville/Madison County*. Towery Publishing, Inc., Memphis, Tennessee.

City of Huntsville. 2001. *Public Transportation, Huntsville, Alabama*. http://www.ci.huntsville. al.us/PublicTran/index.html. Department of Public Transportation, Huntsville, Alabama. Accessed June 15, 2004.

City of Huntsville. 2003. *Huntsville, Alabama USA.* http://www.ci.Huntsville.al.us/AboutHville/ CityCharacteristics.html. City of Huntsville, Alabama. Accessed September 25, 2003.

Crestwood Medical Center. 2003. *Crestwood Medical Center*. http://www.crestwoodmedcenter. com. Accessed September 25, 2003.

Department of the Army. 2004. *Request for Qualifications. Central. Fort Knox, Kentucky, Fort Leavenworth, Kansas, Redstone Arsenal, Alabama*. W912DR-04-R-0012. Appendix B, Part 1: Redstone Arsenal, Alabama. Department of the Army, Washington, DC. July.

Fox AHC (Army Health Center). 2003. *Fox Army Health Center*. http://www.redstone.amedd. army.mil/index.asp. Accessed September 25, 2003.

GlobalSecurity. 2002. *Redstone Arsenal.* http://www.globalsecurity.org/military/facility/ redstone.htm. Accessed September 25, 2003.

Hewitt, 2004. Personal Communication between Kenneth Hewitt, Directorate of Public Works, Environmental Office, Redstone Arsenal, Alabama and Amaka Oji, Tetra Tech Fairfax, Virginia. April 2004.

Huntsville Hospital. 2001. *Huntsville Hospital: Your Hospital for Life.* http://www.hhsys.org. Accessed September 25, 2003.

IT Corporation. 2002. *Sitewide Karst Hydrogeologic Investigation: Phase I Report of Findings, Redstone Arsenal, Madison County, Alabama.* Prepared for U.S. Army Corps of Engineers, Savannah District by IT Corporation, Knoxville, Tennessee. January.

Jones Lang Lasalle. 2002. *Residential Communities Initiative Due Diligence - Book One.* Prepared for Redstone Arsenal, Alabama, by Jones Lang LaSalle, Inc. December.

Lake Guntersville Chamber of Commerce. 2002. *Welcome to Guntersville, Alabama*. http://www.lakeguntersville.org. Accessed September 26, 2003.

McNutt, C.H., Jr., T. Benyshek, R. Ezell, and S. Tushingham. 1998. *Phase I Archeological Investigations of Ground Disturbance Areas 1, 2, 3, 6, 9, and 10, Redstone Arsenal, Alabama*. TRC Garrow Associates, Inc., Memphis, Tennessee. September.

NCES (National Center for Education Statistics). 2003. Common Core of data search for public school districts. http:// http://nces.ed.gov/ccd/schoolsearch. Accessed September 25, 2003.

Niehaus (Robert D. Niehaus, Inc.). 2003. *Redstone Arsenal, Alabama, 2002 Family Housing Market Analysis.* Draft report. Robert D. Niehaus, Inc., Santa Barbara, California. March.

NRCS (Natural Resources Conservation Service). 2003. *Hydric Soils State Lists.* http://soils.usda.gov/use/hydric/lists/state.html. Accessed December 2, 2003.

Parsons HBA (Harland Bartholomew and Associates, Inc.). 1999. *Prefinal Real Property Master Plan Land Use Analysis for Redstone Arsenal.* Prepared for Directorate of Environmental Management and Planning, Redstone Arsenal, Alabama. February.

PCSHouseExpress. 2002. *Army Housing: Redstone Arsenal.* http://www.pcshousearmy.com/ installations/Redstone.htm. Accessed September 25, 2003.

RASA-DEM (Redstone Arsenal Support Activity, Directorate of Environmental Management). 2001. *Redstone Arsenal, Alabama Basic Information Maps.* Prepared for Redstone Arsenal by the Redstone Arsenal Support Activity, Directorate of Environmental Management. February.

RASA-DEM (Redstone Arsenal Support Activity, Directorate of Environmental Management). 2002. *Redstone Arsenal, Alabama, Natural Resources Management Plan.* Prepared for Redstone Arsenal by the Redstone Arsenal Support Activity, Directorate of Environmental Management. October.

Redstone Arsenal. 2001. *Natural Resources Management Plan for Redstone Arsenal.* Redstone Arsenal, Huntsville, Alabama.

Redstone Arsenal. 2002a. *Annual Drinking Water Quality Report 2002*. U.S. Army Aviation and Missile Command. Redstone Arsenal, Alabama.

Redstone Arsenal. 2002b. *Installation Pest Management Plan for U.S. Army Garrison-Redstone, Redstone Arsenal, Alabama*. Redstone Arsenal, Alabama. December.

Redstone Arsenal. 2003. *Annual Drinking Water Quality Report 2003.* U.S. Army Aviation and Missile Command. Redstone Arsenal, Alabama.

Redstone Arsenal. 2003a. *Asbestos Survey*. Redstone Arsenal, Alabama. March.

Redstone Arsenal. 2004. *Redstone Arsenal Transformer PCB Survey Data*. Redstone Arsenal, Alabama. April.

Redstone Arsenal DPW (Directorate of Public Works). 2004. *GIS Files for Redstone Arsenal.* Redstone Arsenal Directorate of Public Works, Redstone Arsenal, Alabama.

Shaw. 2003. *Installation Action Plan for Redstone Arsenal.* Shaw Environmental and Infrastructure, Inc. March.

SMC and IERA (Space and Missile Systems Center and Institute for Environment, Safety, and Occupational Health Risk Analysis). 2000. *Public Draft Environmental Assessment for the Space-Based Laser Integrated Flight Experiment Ground Testing.* Prepared by SCM, Los Angeles Air Force Base, California and IERA, Brooks Air Force Base, Texas, for Ballistic Missile Defense Organization (BMDO), Office of Secretary of Defense.

SSURGO (State Survey Geographic Database). 2003. *State Survey Geographic (SSURGO) Database for Madison County, Alabama*. http://www.nrcs.usda.gov/ssur_data.html. Accessed December 1, 2003.

Tetra Tech. 1995. *Realignment of Redstone Arsenal, Draft Environmental Assessment.* Prepared for Redstone Arsenal, Huntsville, Alabama, by Tetra Tech, Inc., Fairfax, Virginia.

Tetra Tech. 2004. *Draft Environmental Baseline Survey of the Army Residential Communities Initiative at Redstone Arsenal, Alabama*. August.

Trierweiller, W.N., R.D. Holmes, R.D. Nichols, J. Madden, and E.A. Schneider. 1998. *Integrated Cultural Resource Management Plan for Redstone Arsenal, Alabama.* Revised 2002. Prepared for U.S. Army Corps of Engineers-Redstone Arsenal by TRC Mariah Associates, Inc., Austin, Texas. November.

UA News (*The University of Alabama News*). 2000. Metro Area Populations Grow; Shelby Still Fastest Growing County in the State. http://uanews.ua.edu/anews2003/apr03/censusinfo042403. htm. Accessed September 23, 2003.

USACE (U.S. Army Corps of Engineers), St. Louis District. 1995. *Collections Summary for Redstone Arsenal, Alabama*. U.S. Army NAGPRA Compliance Project, Technical Report No. 70. The St. Louis District Mandatory Center of Expertise for the Curation and Management of Archaeological Collections, St. Louis. On file, Redstone Arsenal, Alabama.

USACE (U.S. Army Corps of Engineers), St. Louis District. 1996. *Results of the Physical Inventory of Human Remains and Associated Funerary Objects in Archaeological Collections, Redstone Arsenal, Alabama: Information Provided for Compliance with Native American Graves Protection and Repatriation Act, Section 5 Inventory*. December.

US DOC, BEA (U.S. Department of Commerce, Bureau of Economic Analysis). 2003a. *Total Full-time and Part-time Employment by Industry*. http://www.bea.doc.gov/bea/regional/reis/ action.com. Accessed September 24, 2003.

US DOC, BEA (U.S. Department of Commerce, Bureau of Economic Analysis). 2003b. *Local Area Personal Income*. http://www.bea.doc.gov/bea/reagional/reis/drill.cfm. Accessed September 24, 2003.

US DOC, BLS (U.S. Department of Commerce, Bureau of Labor Statistics). 2003. *National Average Annual Unemployment Rate*. http://data.bls.gov/servlet/SurveyOutputServlet. Accessed September 8, 2003.

US DOC, Census (U.S. Department of Commerce, Bureau of the Census). 1990. *1990 Census Bureau of Population and Housing, Summary Tape File 1 (100% Data)*. http://quickfacts.census.gov/qfd/states/36000.html. U.S. Department of Commerce, Bureau of the Census. Accessed September 21, 2003.

US DOC, Census (U.S. Department of Commerce, Bureau of the Census). 2003. *State and County Quickfacts*. http://quickfacts.census.gov/qfd/states/01000.html. Accessed September 23, 2003.

USFWS (U.S. Fish and Wildlife Service). No date. *Wheeler National Wildlife Refuge*. http://wheeler.fws.gov/. Accessed September 26, 2003.

USGS (U.S. Geological Survey). 1991. 1:24,000-scale map of the Madison, Alabama Quadrangle. U.S. Geological Survey, Reston, Virginia.

USGS and NPS (U.S. Geological Survey and National Park Service). 2003. *Geological Provinces of the United States*. http://wrgis.wr.usgs.gov/docs/usgsnps/province/province.html. Accessed June 13, 2003.

SECTION 7.0
LIST OF PREPARERS

John Beckman
M.E.M., Water and Air Resources Management, Duke University
B.A., Biology, University of California, Santa Cruz
Years of Experience: 10

Mike Betteker
M.S., Environmental Science and Engineering, Virginia Polytechnic Institute and State University
B.S., Biology, Florida Institute of Technology
Years of Experience: 23

Paula Bienenfeld
Ph.D., Anthropology, State University of New York-Binghamton
M.A., Anthropology, State University of New York-Binghamton
B.A., Anthropology, University of Michigan
Years of Experience: 24

Michelle Cannella
Graduate Studies, Mineral Economics, Pennsylvania State University
B.S., Mineral Economics, Pennsylvania State University
Years of Experience: 9

Eric Dohner
M.S., Marine Science, University of South Florida
B.S., Marine Biology, Millersville State College
Years of Experience: 15

Jeff Dorman
B.S., Biology and Environmental Studies, St. Lawrence University
Years of Experience: 3

Elizabeth Fauber
B.S., English and Anthropology, Tulane University
Years of Experience: 15

Jennifer Jarvis
B.S., Environmental Resource Management, Virginia Polytechnic Institute and State University
Years of Experience: 5

Alan Karnovitz
M.P.P., Public Policy, University of Pennsylvania, Wharton School
B.S., Biology of Natural Resources, University of California, Berkeley
Years of Experience: 25

Tom Magness
M.S., Geography, University of Wisconsin
B.S., Civil Engineering, United States Military Academy
Years of Experience: 35

Martha Martin
B.A., English, Capital University
Years of Experience: 22

Mike Moran
Ph.D., Biochemistry, University of Cincinnati
M.A., Chemistry, Montana State University
Years of Experience: 32

Christopher Nordstrom
M.S., Biology, University of Central Florida
B.S., Marine Biology, Auburn University
Years of Experience: 5

Amaka Oji
B.S., Chemical Engineering, University of Pittsburgh
Years of Experience: 3

Catherine Price
B.S. Chemical Engineering, Georgia Institute of Technology
B.S. Chemistry, Albany State University
Years of Experience: 24

Kristin Shields
B.A., Environmental Science, Sweet Briar College
Years of Experience: 14

Patrick Solomon
M.S., Geography, University of Tennessee
B.A., Geography, Geneseo State University
Years of Experience: 10

Paul Wilbur, J.D.
J.D., Wayne State University Law School
B.A., English, University of Michigan
Years of Experience: 29

SECTION 8.0
PERSONS CONSULTED

Booker, Terry. Redstone Arsenal, Directorate of Environment and Safety. April 6, 2004.

Daniels, Eugene. Redstone Arsenal, Directorate of Environment and Safety. April 6, 2004.

de la Paz, Terry. Redstone Arsenal, Directorate of Environment and Safety. April 6, 2004.

Dunn, Danny. Redstone Arsenal, Directorate of Environment and Safety. April 6, 2004.

Hewitt, Ken. Redstone Arsenal, Directorate of Environment and Safety. April 6, 2004; December 13, 2005.

Horton, Jesse. Redstone Arsenal, Directorate of Environment and Safety. April 6, 2004.

Seaver, Dan. Redstone Arsenal, Directorate of Environment and Safety. April 6, 2006.

Makkouk, Ramzi. Redstone Arsenal, Directorate of Environment and Safety. April 6, 2004.

Moore, Mike. Redstone Arsenal, Directorate of Environment and Safety. April 6, 2004.

Northridge, Craig. Redstone Arsenal, Directorate of Environment and Safety. April 6, 2004.

Norton, Tom. Redstone Arsenal, Directorate of Environment and Safety. April 6, 2004.

Pearsall, Russell. Redstone Arsenal, DPW. 2004, 2005.

Souza, John. Redstone Arsenal, Directorate of Environment and Safety. April 6, 2004.

Wu, Carolene. Redstone Arsenal. November 21, 2005.

SECTION 9.0
DISTRIBUTION LIST

Reference Librarian
Huntsville Main Library
915 Monroe Street
Huntsville, AL 35801

U.S. Army Aviation & Missile Command
Public Affairs Office
AMSAM-PA
5300 Martin Road
Redstone Arsenal, AL 35898

U.S. Army Aviation & Missile Command
Redstone Post Library
Attn: Ms. Gail Alden
Building 3323
Redeye Road
Redstone Arsenal, AL 35898

U.S. Army Aviation & Missile Command
Redstone Scientific Information Center
AMSRD-AMRDEC-IN-IC
Attn: Martha Knott
Building 4484
Redstone Arsenal, AL 35898

Catherine Fox
USEPA REGION 4
61 Forsyth Street, SW
Atlanta, GA 30303

Dwight Cooley
Wheeler National Wildlife Refuge
2700 Refuge Headquarters Road
Decatur, AL 35603

Elizabeth Brown
Interim Executive Director
Alabama Historical Commission
468 South Perry Street
Montgomery, AL 36130

Advisory Council on Historic Preservation
1100 Pennsylvania Ave. NW, Suite 809
The Old Post Office Building
Washington, DC 20004

APPENDIX A

Draft Community Development and Management Plan Brief

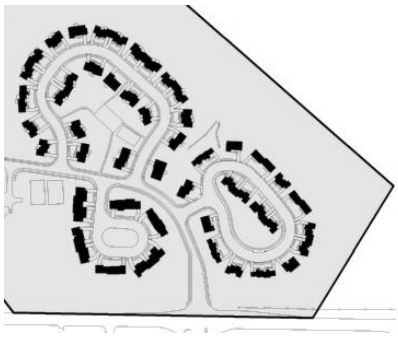
REDSTONE ARSENAL

RESIDENTIAL COMMUNITIES INITIATIVE

Existing Housing

Analysis

REDSTONE ARMY FAMILY HOUSING, LLC



AREA 1 - HOUSING

ANALYSIS:

1. High density and unattractive homes
2. Dominance of 2 Br Units
3. Difficult and expensive to renovate two story units
4. Will require whole-house renovation in 17 years at age of 37 years

RECOMMENDATION:

1. Utilize as part of 120 additional home option and demolish in 17 years
2. No additional area or enhancements provided

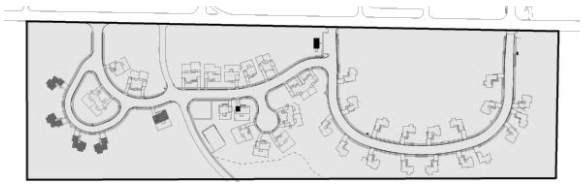
REDSTONE ARMY FAMILY HOUSING, LLC

ANALYSIS:

1. Medium density housing with single family, duplex and one quad-plex building
2. Newer homes currently designated as SNCO units and 4 Prestige Units
3. Homes can be re-designated as JNCO units and meet RCI gross area standards

RECOMMENDATION:

1. Retain housing with no area upgrades
2. Provide garages and additional minor enhancements if possible



AREA 2 - HOUSING

REDSTONE ARMY FAMILY HOUSING, LLC

AREA 3 - HOUSING

ANALYSIS:

1. Low density housing with mature landscaping
2. Housing outdated and experiencing termite infestation
3. Some housing now under demolition

RECOMMENDATION:

1. Demolish units as needed

REDSTONE ARMY FAMILY HOUSING, LLC

ANALYSIS:

1. Medium density housing with single family and duplex homes
2. Newer homes currently designated as JNCO units
3. Homes can remain as JNCO units and meet RCI gross area standards
4. Renovation for area increase not required and not cost effective due to home's new construction
5. Smaller kitchens, living areas and bedrooms not appropriate for officers

AREA 4a & 4b - HOUSING

RECOMMENDATION:

1. Retain housing with no area upgrades
2. Designate as JNCO units to avoid disturbing existing occupants and provide minor upgrades if possible

REDSTONE ARMY FAMILY HOUSING, LLC

AREA 5 - HOUSING

ANALYSIS:

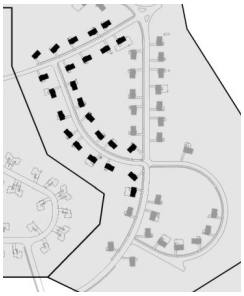
1. Low density housing with mature landscaping
2. Exceptional neighborhood feel of natural environment and spacing of homes
3. Existing homes have recently received $30,000 to $50,000 in window, door, bath and kitchen upgrades
4. Existing homes have larger kitchens and bedrooms than new units making them more appropriate for higher grade homes
5. Housing appearance outdated, however renovation and revitalization of neighborhood possible and more cost effective than renovating newly constructed homes
6. Housing currently unoccupied which will facilitate renovation without disturbing residents
7. Ample area between units to allow for two car garage expansion

RECOMMENDATION:

1. Renovate and revitalize homes

REDSTONE ARMY FAMILY HOUSING, LLC

AREA 6 - HOUSING



ANALYSIS:

1. Same density, neighborhood and landscaping comments as Area 5 homes
2. Many homes are currently occupied
3. Homes have small gross areas
4. Homes only have 1.5 baths

RECOMMENDATION:

1. Renovate a minimum quantity to achieve end state demographics
2. Retain remaining homes as part of option of additional 120 homes
3. Demolish remaining balance in 17 years

REDSTONE ARMY FAMILY HOUSING, LLC

ANALYSIS:

1. Area 10b contains larger single family housing homes
2. Area 10a contains two story duplex homes
3. Area10a homes are outdated and difficult to renovate due to two story configurations
4. Area 10b homes are larger than Area 5 and can be renovated as FGO and/or Prestige homes

AREA 10a & 10b - HOUSING

RECOMMENDATION:

1. Retain Area 10b housing and renovate for FGO and Prestige units
2. Demolish Area 10a duplex units

REDSTONE ARMY FAMILY HOUSING, LLC

REDSTONE ARSENAL

RESIDENTIAL COMMUNITIES INITIATIVE

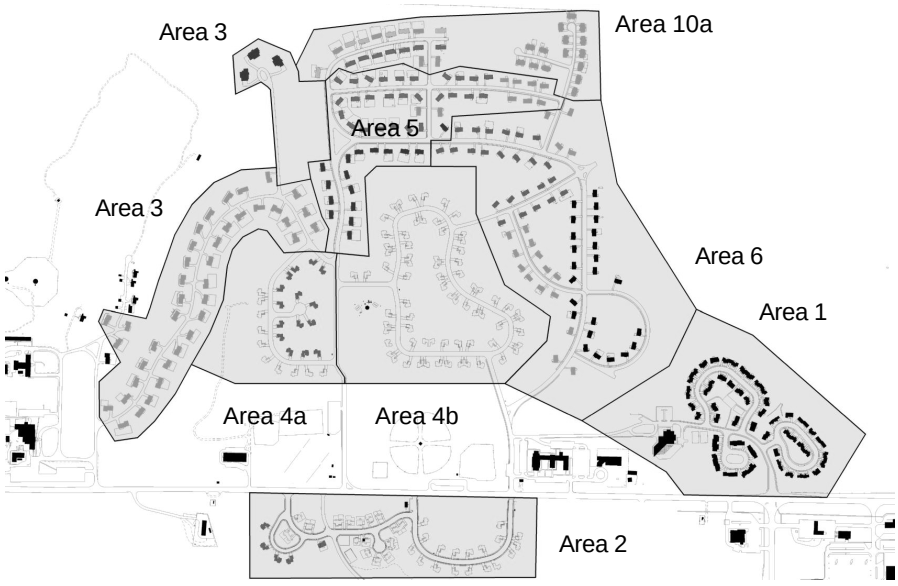
Master Planning

Concepts

REDSTONE ARMY FAMILY HOUSING, LLC

EXISTING HOUSING MASTER PLAN

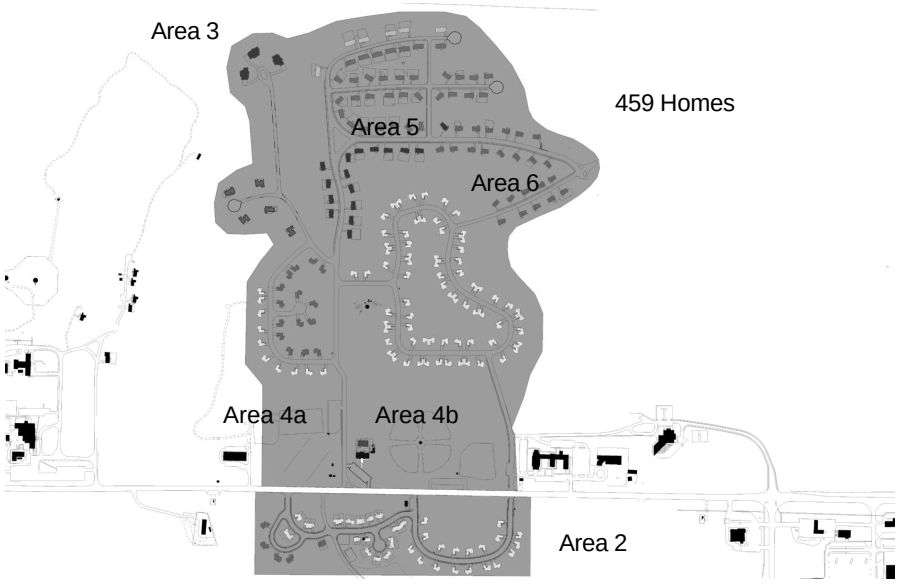
459 Homes



REDSTONE ARMY FAMILY HOUSING, LLC

PROPOSED HOUSING MASTER PLAN

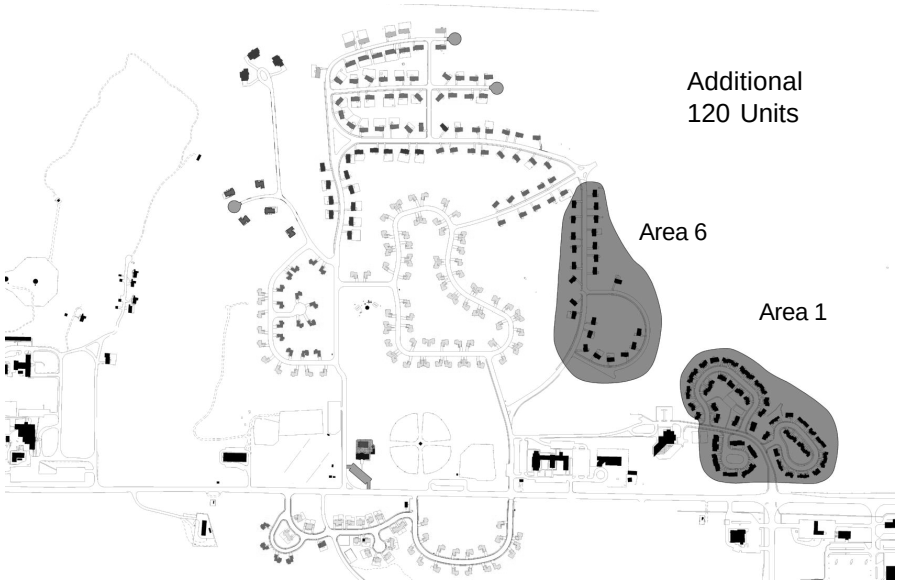
230 Homes



REDSTONE ARMY FAMILY HOUSING, LLC

OPTIONAL HOUSING MASTER PLAN

350 Homes



REDSTONE ARMY FAMILY HOUSING, LLC

REDSTONE ARSENAL

RESIDENTIAL COMMUNITIES INITIATIVE

New Capehart Revitalization

REDSTONE ARMY FAMILY HOUSING, LLC

Existing Elevation

Capehart Area 6

REDSTONE ARMY FAMILY HOUSING, LLC

Renovated SNCO Elevation

Capehart Area 6

REDSTONE ARMY FAMILY HOUSING, LLC

Landscaped SNCO Elevation

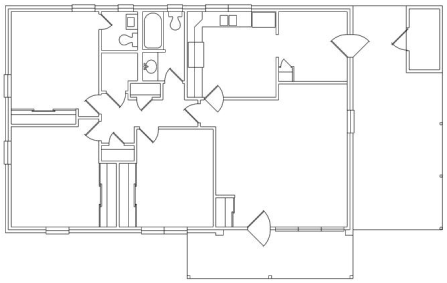
Capehart Area 6

REDSTONE ARMY FAMILY HOUSING, LLC

3 Br/1.5 Bath Home

Gross Living Area

1,350 S.F.



Existing Plan #11

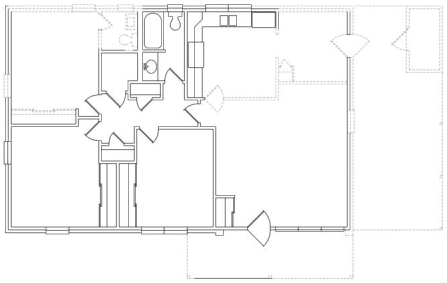
Capehart Area 6

REDSTONE ARMY FAMILY HOUSING, LLC

3 Br/1.5 Bath Home

Gross Living Area

1,350 S.F.



Demolition Plan #11

Capehart Area 6

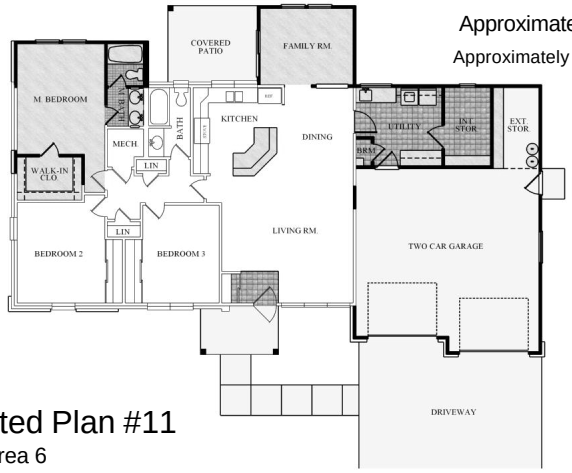
REDSTONE ARMY FAMILY HOUSING, LLC

3 Br/1.5 Bath Home

Gross Living Area

Approximately 1,763 S.F.

Approximately 413 S.F. Added



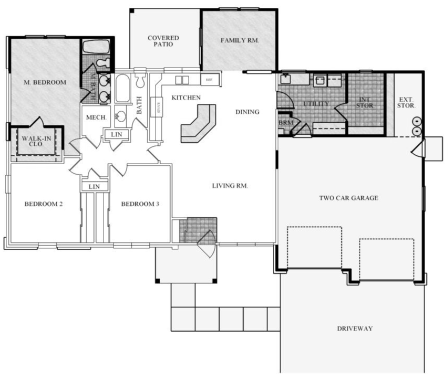
Renovated Plan #11

Capehart Area 6

NEW SNCO 3 BR PLAN

REDSTONE ARMY FAMILY HOUSING, LLC

3 Br/2 Bath Home



SNCO HOME

Renovated Plan #11

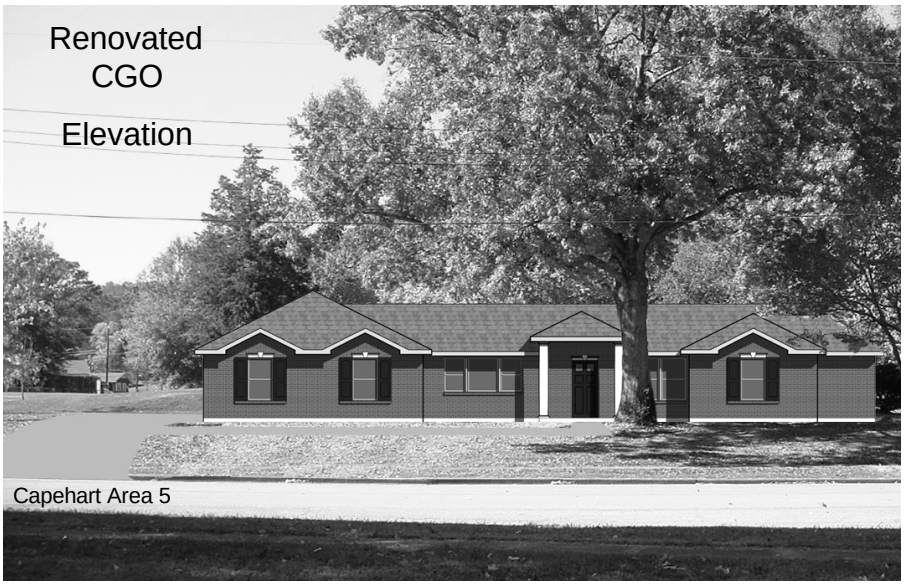
Capehart Area 6

Design Features

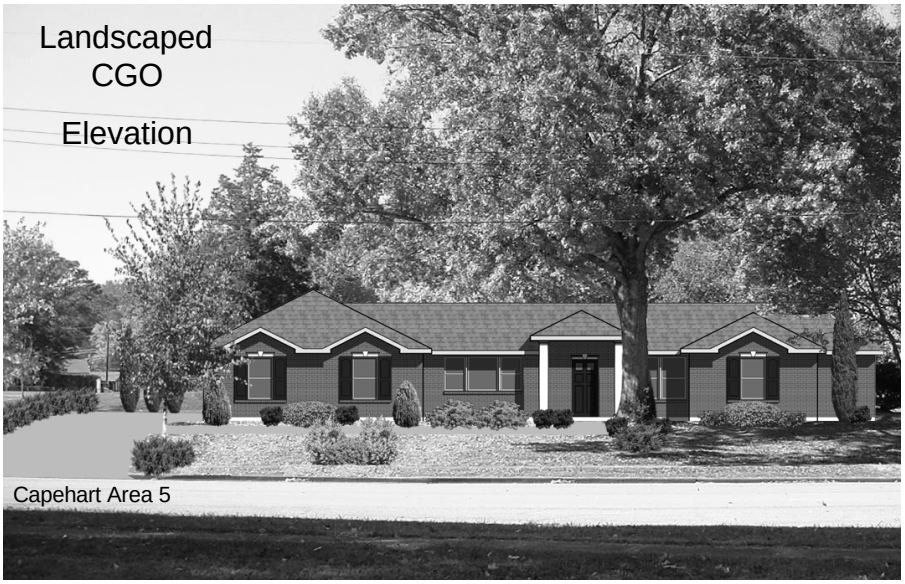
- Two Car Garage
- Expanded Master Br.
- Double Vanity in Master Bath
- Walk-in Closet in Master Br.
- Open Modern Kitchen
- Bar Counter
- New Vaulted Family Room
- New Covered Patio
- New Utility Room w/Sink, Folding Counter and Storage Cabinets
- New Interior and Exterior Storage

REDSTONE ARMY FAMILY HOUSING, LLC

REDSTONE ARMY FAMILY HOUSING, LLC



REDSTONE ARMY FAMILY HOUSING, LLC

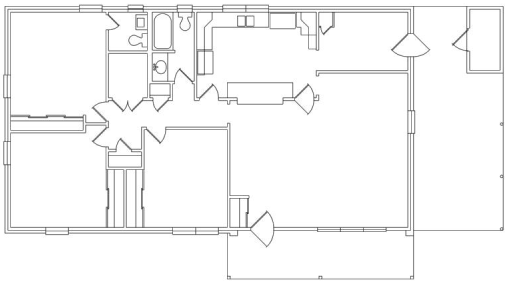


REDSTONE ARMY FAMILY HOUSING, LLC

3 Br/1.5 Bath Home

Gross Living Area

1,594 S.F.



Existing Plan #9

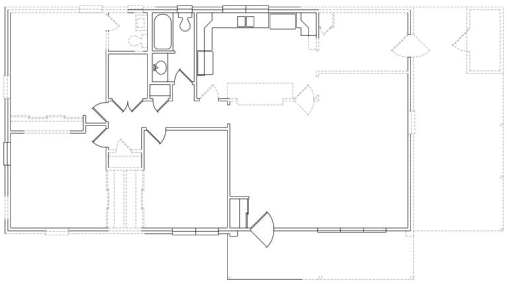
Capehart Area 5

REDSTONE ARMY FAMILY HOUSING, LLC

3 Br/1.5 Bath Home

Gross Living Area

1,594 S.F.



Demolition Plan #9

Capehart Area 5

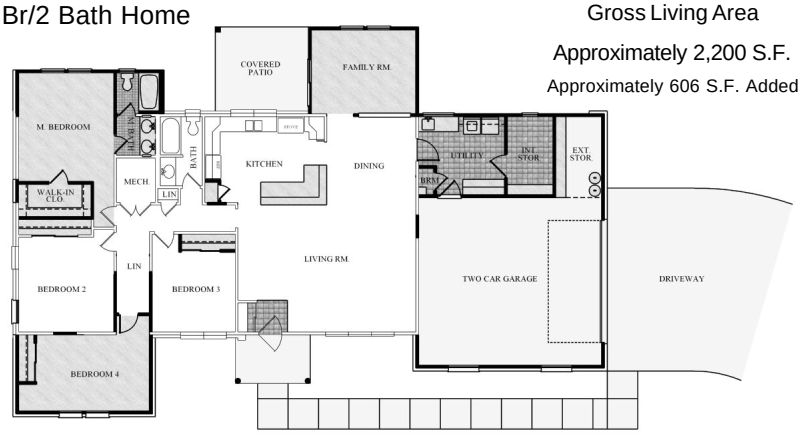
REDSTONE ARMY FAMILY HOUSING, LLC

4 Br/2 Bath Home

Gross Living Area

Approximately 2,200 S.F.

Approximately 606 S.F. Added



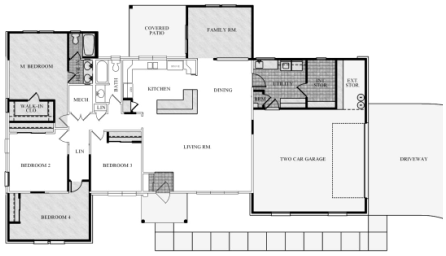
Renovated Plan #9

Capehart Area 5

NEW CGO 4 BR PLAN

REDSTONE ARMY FAMILY HOUSING, LLC

4 Br/2 Bath Home



CGO HOME

Renovated Plan #9

Capehart Area 5

Design Features

- Two Car Garage – 9' Doors
- Side Entry Garages in Select Locations
- Expanded Master Br.
- Double Vanity in Master Bath
- Walk-in Closet in Master Br.
- Open Modern Kitchen
- Angled Bar Counter
- New Vaulted Family Room
- New Covered Patio
- New Utility Room w/Sink, Folding Counter and Storage Cabinets

REDSTONE ARMY FAMILY HOUSING, LLC

REDSTONE ARMY FAMILY HOUSING, LLC

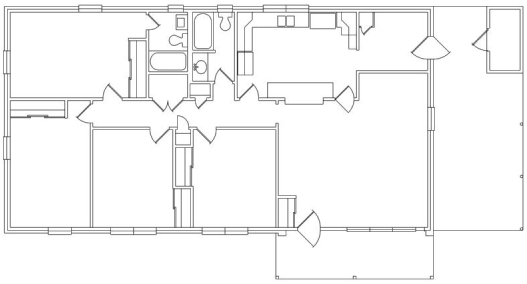
REDSTONE ARMY FAMILY HOUSING, LLC

REDSTONE ARMY FAMILY HOUSING, LLC

4 Br/2 Bath Home

Gross Living Area

1,673 S.F.



Existing Plan #10

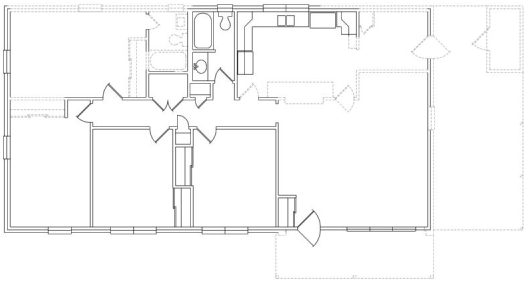
Capehart Area 5

REDSTONE ARMY FAMILY HOUSING, LLC

4 Br/2 Bath Home

Gross Living Area

1,673 S.F.



Demolition Plan #10

Capehart Area 5

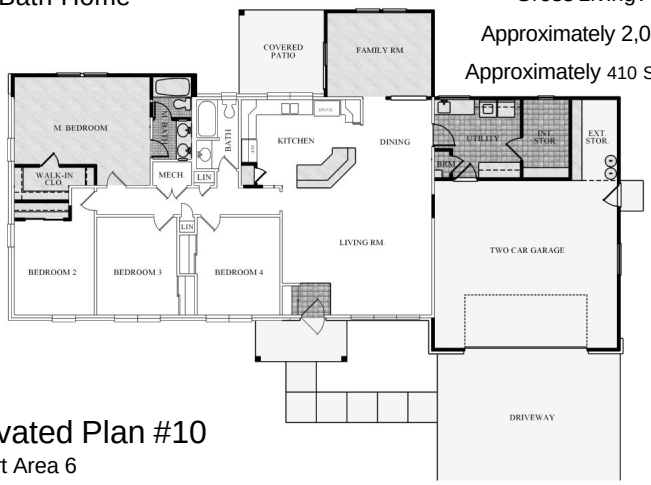
REDSTONE ARMY FAMILY HOUSING, LLC

4 Br/2 Bath Home

Gross Living Area

Approximately 2,083 S.F.

Approximately 410 S.F. Added



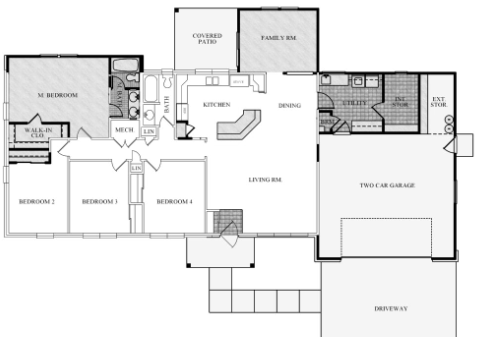
Renovated Plan #10

Capehart Area 6

NEW FGO 4BR PLAN

REDSTONE ARMY FAMILY HOUSING, LLC

4 Br/2 Bath Home



FGO HOME

Renovated Plan #10

Capehart Area 6

Design Features

- Two Car Garage
- Expanded Master Br.
- Double Vanity in Master Bath
- Walk-in Closet in Master Br.
- New Dining Area
- Angled Bar Counter
- New Vaulted Family Room
- New Covered Patio
- New Utility Room w/Sink, Folding Counter and Storage Cabinets
- Brick, Stone and Siding Exteriors

REDSTONE ARMY FAMILY HOUSING, LLC

APPENDIX B

Record of Non-Applicability

RECORD OF NON-APPLICABILITY CONCERNING THE GENERAL CONFORMITY RULE

(*Code of Federal Regulations*, Title 40 Part 51)

Congress enacted Section 2801 of the 1996 Defense Authorization Act (Public Law 104-106; codified at 10 U.S.C. 2871-85). This law, known as the Military Housing Privatization Initiative, gives the Army alternative authorities for improvement and construction of military family housing allowing the Army to obtain private sector funding to satisfy family housing requirements.

Redstone Arsenal, Alabama, proposes to remedy the family housing deficiencies by privatizing family housing functions through implementation of the Army Residential Communities Initiative. Under this proposal, the installation would enter into a contract to have a private developer change the on-post inventory of family housing to reflect current and future needs.

Conformity under the Clean Air Act, Section 176, has been evaluated for the proposed action in accordance with Title 40 of the *Code of Federal Regulations* (CFR) Part 51. The requirements of this rule are not applicable to this action because Madison County, Alabama, in which Redstone Arsenal is completely situated, is in attainment for all criteria air pollutants. The General Conformity Rule, therefore, does not apply to this federal action.

Terry W. Hazle
Chief, Environmental Management Division

12-19-2005
Date

REDSTONE ARSENAL RCI PROJECT CRITERIA POLLUTANTS

The calculated criteria pollutant loads are:

NOx	15.03
SOx	0.94
VOC	2.63
PM10	1.97
CO	13.58
Total:	**34.15**

APPENDIX C

Agency Correspondence

DEPARTMENT OF THE ARMY
UNITED STATES ARMY GARRISON – REDSTONE
4488 MARTIN ROAD
REDSTONE ARSENAL, ALABAMA 35898-5000

REPLY TO
ATTENTION OF

Environmental Management Division

S: September 22, 2005

AUG 2 9 2005

Mr. Larry Goldman
US Fish and Wildlife Service
1208-B Main Street
Post Office Drawer 1190
Daphne, Alabama 36526

Dear Mr. Goldman:

The US Army Garrison – Redstone is preparing an Environmental Assessment (EA) for the implementation of the Residential Communities Initiative (RCI) program at Redstone Arsenal, located within Madison County, in the heart of Huntsville, Alabama. The RCI program will privatize the management, operation, and maintenance of housing and ancillary supporting facilities at Redstone Arsenal. The purpose of the EA is to evaluate the potential effects of the implementation of the RCI program at Redstone Arsenal on the natural and human environment.

Under the proposed action, Redstone Arsenal would convey all existing on-post family housing units and selected ancillary supporting facilities to a private development entity to provide affordable, quality housing through a combination of replacement of and improvement to existing housing units. The installation currently has 457 family housing units and plans to downsize through attrition (demolishing older units) to 230 units. The initial development plan will be implemented over a 15 year period beginning around June 2006. The Army would grant the development entity a free 50 year lease of approximately 340 acres of land.

In accordance with the National Environmental Policy Act, Endangered Species Act, and Fish and Wildlife Coordination Act, an evaluation of the potential effects (both beneficial and adverse) associated with implementing this action is required. We are requesting your input concerning any biological concerns regarding this action, such as the presence of federally listed threatened or endangered species, or critical habitat. For quick reference, the affected area can be found on the Madison, Alabama USGS quadrangle or on the attached location map of Redstone Arsenal. The remainder of the installation can be found on the Huntsville, Triana, and Farley, Alabama quads.

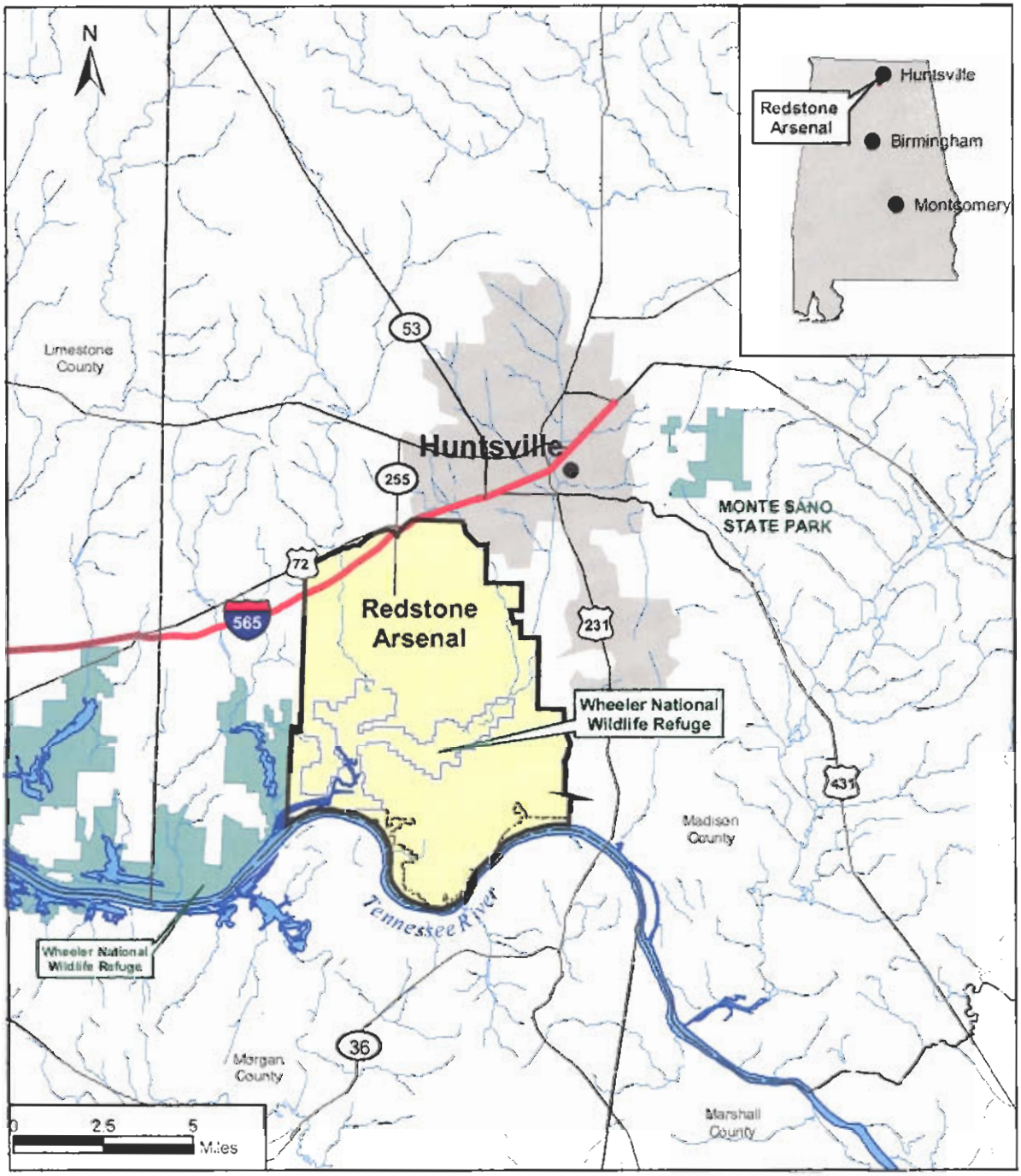
To assist us in our evaluation of the project, please submit any comments or concerns you may have about the project to the POC below by **September 22, 2005**.

The point of contact for this action is Mr. Danny Dunn, Environmental Management Division (IMSE-RED-PWE), e-mail danny.dunn@redstone.army.mil, 256-876-4572.

Sincerely,

Terry W. Hazle
Chief, Environmental Management
Division

Enclosures



Installation Location Map

Figure 1-1

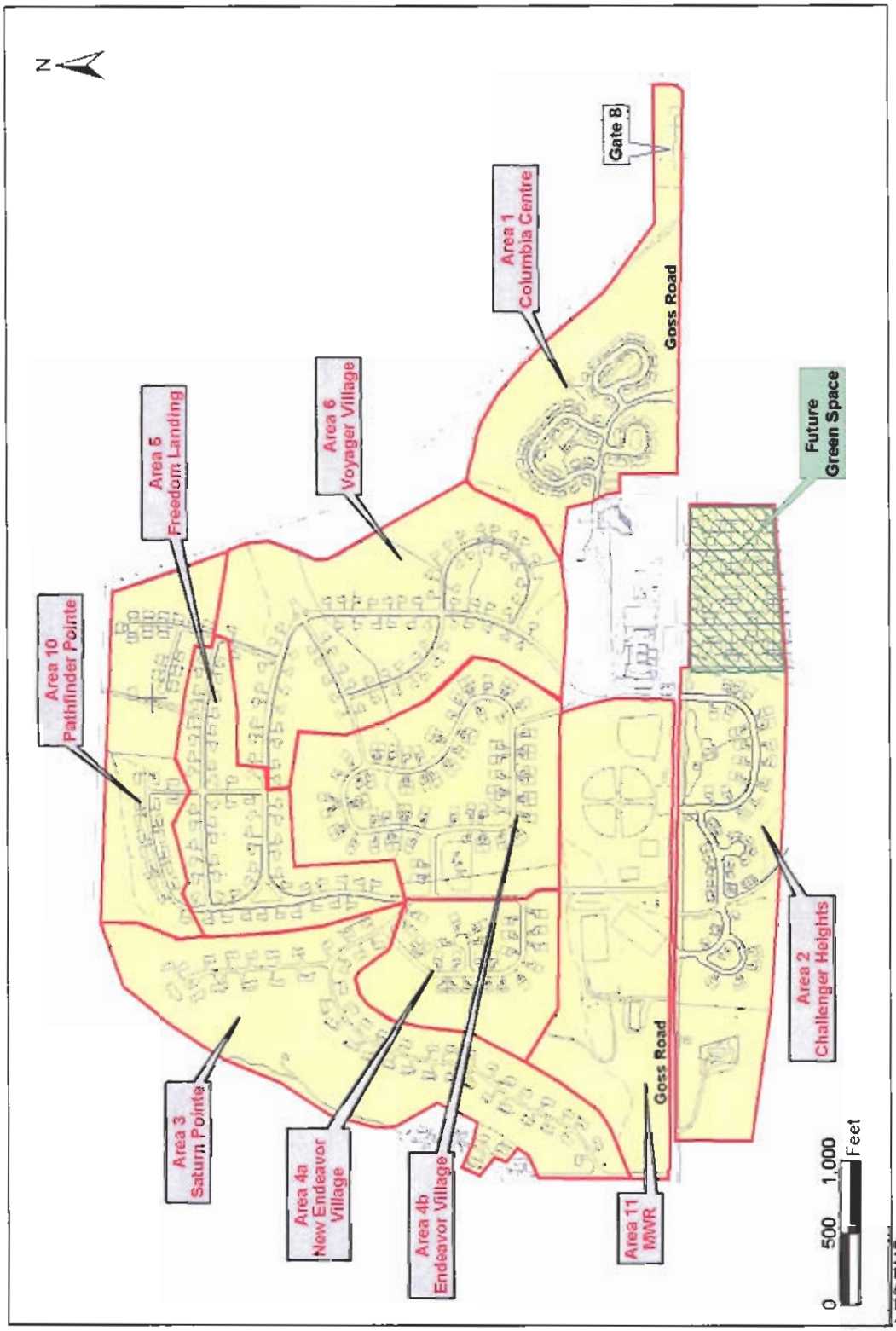

N
Redstone Arsenal RCI Footprint
Gate 8
Area 1
Columbia Centre
Goss Road
Area 6
Voyager Village
Area 5
Freedom Landing
Area 10
Pathfinder Pointe
Future
Green Space
Area 2
Challenger Heights
Area 3
Saturn Pointe
Area 4a
New Endeavor
Village
Area 4b
Endeavor Village
Area 11
MWR
Goss Road
0
500
1,000
Feet
LEGEND
RCI Footprint
Source: Redstone Arsenal DPW, 2004.

Figure 2-1

United States Department of the Interior

FISH AND WILDLIFE SERVICE
1208-B Main Street
Daphne, Alabama 36526

IN REPLY REFER TO:
05-1248

September 20, 2005

Department of the Army
United States Army Garrison-Redstone
Environmental Management Division
Attn: Mr. Danny Dunn
4488 Martin Road
Redstone Arsenal, AL 35898-5000

Dear Mr. Dunn:

Thank you for your letter, dated August 29, 2005, requesting coordination concerning the Residential Communities Initiative (RCI) program at Redstone Arsenal, Alabama. We have reviewed the information you enclosed and are providing the following comments in accordance with the Endangered Species Act of 1973 (87 Stat. 884, as amended; 16 U.S.C. 1531 et seq.).

The Service believes that the privatization of the management, operation, and maintenance of military housing at Redstone Arsenal is not likely to adversely affect listed species. Therefore, no further endangered species consultation will be required for this project unless: 1) the identified action is subsequently modified in a manner that causes an effect on listed species or designated Critical Habitat; 2) new information reveals the identified action may affect Federally protected species or designated Critical Habitat in a manner or to an extent not previously considered; or 3) a new species is listed or Critical Habitat is designated under the Endangered Species Act that may be affected by the identified action.

If you need any additional information, please contact Mr. Bruce Porter, at 251-441-5864 and kindly refer to the reference number above.

Sincerely,

Larry E. Goldman
Field Supervisor

DEPARTMENT OF THE ARMY
UNITED STATES ARMY GARRISON – REDSTONE
4488 MARTIN ROAD
REDSTONE ARSENAL, ALABAMA 35898-5000

REPLY TO
ATTENTION OF

S: September 22, 2005

Environmental Management Division

AUG 2 9 2005

Ms. Elizabeth Brown
Deputy State Historic Preservation Officer
Alabama Historical Commission
468 South Perry Street
Montgomery, Alabama 36130-0900

Dear Ms. Brown:

The US Army Garrison – Redstone Arsenal is preparing an Environmental Assessment (EA) for a US Army Housing Project on Redstone Arsenal, Madison County, Alabama. A map of the Arsenal is at enclosure 1 and a map of the proposed Residential Communities Initiative (RCI) footprint is at enclosure 2.

The purpose of the EA is to discuss potential effects on environmental resources that may be caused by the US Army's preferred alternative, which is to privatize the renovation, construction and management of housing facilities at Redstone Arsenal through its RCI program. The US Army now owns and operates the housing facilities within Redstone Arsenal. The Army proposes to lease all the land within the RCI footprint.

The purpose of the proposed action is to improve Army family housing and ancillary supporting facilities at Redstone Arsenal. The proposed action is needed to provide affordable, quality housing and ancillary facilities to soldiers and their families through a combination of replacement and improvement of existing family housing units to allow them to meet current Army standards.

Redstone Arsenal proposes to convey all existing family housing units to a chosen Development Entity and grant a 50 year lease of land under all those buildings. The Development Entity would operate and maintain for 50 years all existing and new family housing and ancillary supporting facilities, including associated parking lots and sidewalks. The Army would identify any easements and rights-of-way that might affect use of the conveyed property. The Army would convey this property with encumbrances, notices, and requirements obligating the Development Entity to certain actions. These encumbrances would be in the form of covenants in the deed and would be binding on the transferee, as well as any subsequent successors or assigns. Negotiated terms of transfer or conveyance may result in requirements for the Development Entity to maintain the status quo of historic buildings or archaeological sites or may impose a requirement for consultation with the State Historic Preservation Officer (SHPO) prior to any actions affecting such resources. The lease would also include a clause placing

prohibitions on removing or disturbing, or causing or permitting to be removed or disturbed, any historical, archaeological, architectural, or other cultural artifacts, relics, remains, or objects of antiquity. In the even such items would be discovered, the Development Entity would be required to immediately notify the Installation Commander or his/her designated representative and protect the site and the material from further disturbance until the Installation Commander or designated representative give clearance to proceed.

There are 459 family housing units on the installation. The age and condition of Redstone Arsenal family housing units vary. Nearly half of the housing units are more than 30 years old. The sizes, configurations, safety, and condition of these older housing units are substantially below the Army's standards of acceptability. These older units lack amenities such as family rooms, laundry/utility space, adequate exterior storage, and auxiliary eating areas such as eat-in kitchens or breakfast nooks. Several housing units have potential health and safety concerns associated with the presence of lead-based paint, asbestos-containing material, and pesticides applied for pest control. Of the 459 housing units at Redstone Arsenal, the Army deems 170 of the housing units at Redstone Arsenal as not adequate and without adequate funding to address the renovation backlog, housing units could potentially decline to a condition where they could be unsuitable for occupancy.

Redstone Arsenal's 459 units of family housing are in seven housing areas in the northern portion of the installation. The housing areas are known as Columbia Centre (Area 1), Challenger Heights (Area 2), Saturn Pointe (Area 3), New Endeavor Village and Endeavor Village (Areas 4a and 4b, respectively), Freedom Landing (Area 5), Voyager Village (Area 6), and Pathfinder Pointe (Area 10). Housing in these areas is configured as multiplexes, duplexes, and single-family dwellings. Table 1, below, shows housing stock by year of construction:

Table 1
Housing Stock by Year of Construction

Constructed	2-BR	3-BR	4-BR	5-BR	Total
1957	0	20	28	0	48
1959	0	115	7	0	122
1972	0	0	48	0	48
1995	66	31	19	4	120
2000	0	22	3	0	25
2002	0	21	17	2	40
2003	0	28	26	2	56
Totals	**66**	**237**	**148**	**8**	**459**

The EA will be prepared pursuant to the National Environmental Policy Act (NEPA) and implementing regulations of the Council on Environmental Quality. In accordance with NEPA, an evaluation of the potential environmental impacts (both positive and negative) associated with implementing the Army's proposed action on the existing resources at Redstone Arsenal and

within the study area is required. The purpose of the proposed (i.e., the preferred) action is to privatize the construction, renovation, and maintenance of residential housing communities within the Redstone Arsenal, as described above. The EA will assess effects of the transfer of housing, and the leasing of underlying property. No property transfer will occur until SHPO coordination is completed. The No Action alternative will also be identified and evaluated, as required. No archaeological sites have been recorded in the RCI footprint at the Redstone Arsenal and some residences date to 1957 and 1959, and were built during the Capehart Era.

Under the process established by NEPA, the Army will provide for participation by members of the public and private sectors to provide input to the Army concerning potential environmental issues associated with implementing the proposed action. Participation includes response to this letter of notification, and comments that you or other interested parties or stakeholders may submit regarding the Draft EA.

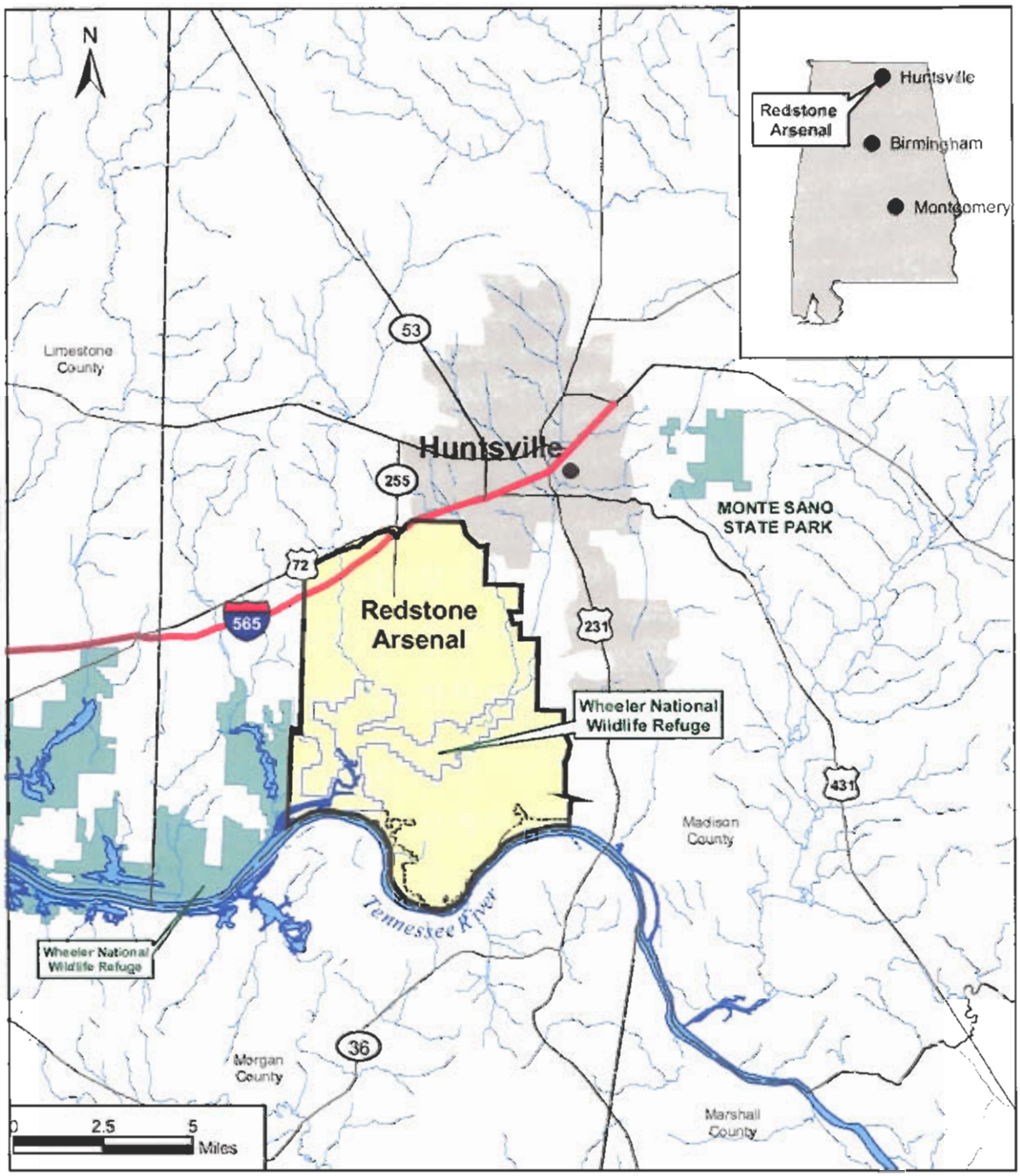
To assist us in our evaluation of the project, please submit any comments or concerns you may have about the project by **September 22, 2005**. Your comments and concerns will be addressed in the Environmental Assessment that will be available for public comment around December 2005.

The point of contact for this action is Mr. Danny Dunn, Environmental Management Division (IMSE-RED-PWE), e-mail danny.dunn@redstone.army.mil, 256-876-4572.

Sincerely,

Terry W. Hazle
Chief, Environmental Management
Division

Enclosures



Installation Location Map

Figure 1-1

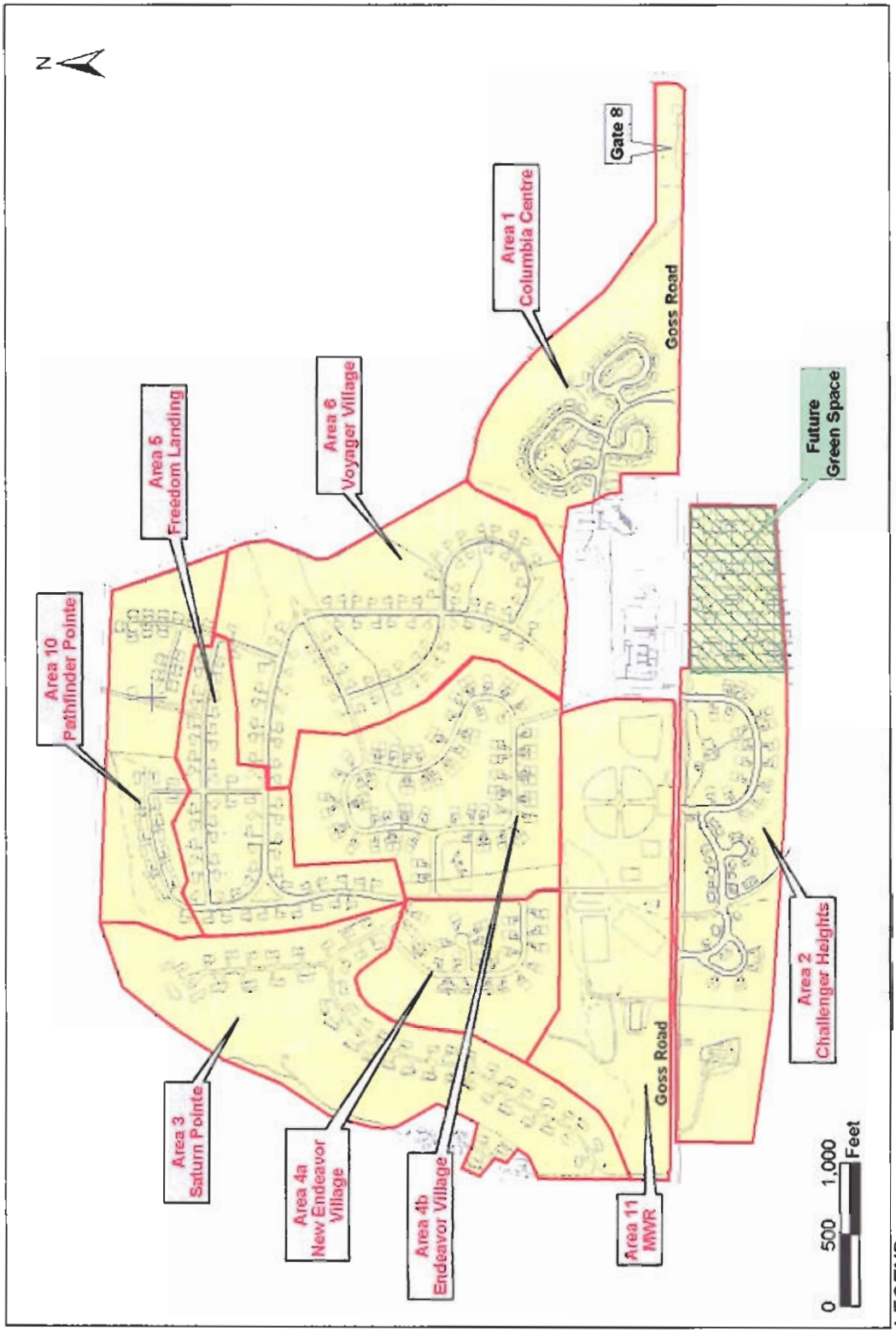

N
Redstone Arsenal RCI Footprint
Gate 8
Goss Road
Area 1
Columbia Centre
Area 6
Voyager Village
Area 5
Freedom Landing
Area 10
Pathfinder Pointe
Future
Green Space
Area 2
Challenger Heights
Area 3
Saturn Pointe
Area 4a
New Endeavor
Village
Area 4b
Endeavor Village
Area 11
MWR
Goss Road
0
500
1,000
Feet
LEGEND
RCI Footprint
Source: Redstone Arsenal DPW, 2004

Figure 2-1

preserveALA
ALABAMA HISTORICAL COMMISSION

September 26, 2005

Terry Hazle
Chief
Environmental Management Division
United States Army Garrison – Redstone
4488 Martin road
Redstone Arsenal, Alabama 35898-5000

Re: AHC 2005-1446; EA for US Army Housing Project, Redstone Arsenal, Madison County

Dear Mr. Hazle:

468 South Perry Street
Montgomery, Alabama
36130-0900

tel 334 242•3184
fax 334 240•3477

Upon review of the above referenced project, the Alabama Historical Commission has determined that we can concur with privatizing renovation, construction and management of housing facilities at Redstone Arsenal with the stipulation that negotiated terms of transfer result in requirements for the Development Entity to maintain the status quo of historic structures or archaeological sites as well as requirements for consultation with the State Historic Preservation Officer prior to any actions with the potential to affect such resources. In addition, the Development Entity must agree to prohibitions on removing or disturbing, or causing or permitting to be removed or disturbed, any historical, archaeological, architectural, or other cultural artifacts, relics, remains, or objects of antiquity. In the event that such items are discovered, the Development Entity shall immediately notify the Installation Commander or his/her designated representative and the State Historic Preservation Office and protect the site and material from further disturbance until the given clearance to proceed. In essence, the Development Entity will assume Section 106 responsibilities for the areas of potential effects over which they have jurisdiction.

We appreciate your efforts on this issue. Should you have any questions, please contact Amanda McBride of our office. Please reference the AHC tracking number above in all correspondence.

Very truly yours,

Elizabeth Ann Brown
Deputy State Historic Preservation Officer

EAB/ALM/SME/alm

APPENDIX D

Economic Impact Forecast System (EIFS)
Model and Methodology

ECONOMIC IMPACT FORECAST SYSTEM (EIFS) MODEL

SOCIOECONOMIC IMPACT ASSESSMENT

Socioeconomic impacts are linked through cause-and-effect relationships. Military payrolls and local procurement contribute to the economic base for the region of influence (ROI). In this regard, renovation, demolition, and construction of family housing at Redstone Arsenal would have a multiplier effect on the local and regional economy. With the proposed action, direct jobs would be created, generating new income and increasing personal spending. This spending generally creates secondary jobs, increases business volume, and increases revenues for schools and other social services.

THE ECONOMIC IMPACT FORECAST SYSTEM

The U.S. Army, with the assistance of many academic and professional economists and regional scientists, developed EIFS to address the economic impacts of NEPA-requiring actions and to measure their significance. As a result of its designed applicability, and in the interest of uniformity, EIFS should be used in NEPA assessments for RCI. The entire system is designed for the scrutiny of a populace affected by the actions being studied. The algorithms in EIFS are simple and easy to understand, but still have firm, defensible bases in regional economic theory.

EIFS is implemented as an on-line system supported by the U.S. Army Environmental Policy Institute (AEPI) through the Computer Information Science Department of Clark Atlanta University, Georgia. The system is available to anyone with an approved user-id and password. University staff and the staff of AEPI are available to assist with the use of EIFS.

The databases in EIFS are national in scope and cover the approximately 3,700 counties, parishes, and independent cities that are recognized as reporting units by federal agencies. EIFS allows the user to define an economic ROI by identifying the counties, parishes, or cities to be analyzed. Once the ROI is defined, the system aggregates the data, calculates multipliers and other variables used in the various models in EIFS, and prompts the user for forecast input data.

THE EIFS MODEL

The basis of the EIFS analytical capabilities is the calculation of multipliers that are used to estimate the impacts resulting from Army-related changes in local expenditures or employment. In calculating the multipliers, EIFS uses the economic base model approach, which relies on the ratio of total economic activity to basic economic activity. Basic, in this context, is defined as the production or employment engaged to supply goods and services outside the ROI or by federal activities (such as military installations and their employees). According to economic base theory, the ratio of total income to basic income is measurable (as the multiplier) and sufficiently stable so that future changes in economic activity can be forecast. This technique is especially appropriate for estimating aggregate impacts and makes the economic base model ideal for the EA and EIS process.

The multiplier is interpreted as the total impact on the economy of the region resulting from a unit change in its base sector; for example, a dollar increase in local expenditures due to an expansion of its military installation. EIFS estimates its multipliers using a location quotient approach based on the concentration of industries within the region relative to the industrial concentrations for the nation.

The user inputs into the model the data elements which describe the Army action: the change in expenditures, or dollar volume of the construction project(s); change in civilian or military employment; average annual income of affected civilian or military employees; the percent of civilians expected to relocate due to the Army's action; and the percent of military living on-post. Once these are entered into the EIFS model, a projection of changes in the local economy is provided. These are projected changes in sales volume, income, employment, and population. These four indicator variables are used to measure and evaluate socioeconomic impacts. Sales volume is the direct and indirect change in local business activity and sales (total retail and wholesale trade sales, total selected service receipts, and value-added by manufacturing). Employment is the total change in local employment due to the proposed action, including not only the direct and secondary changes in local employment, but also those personnel who are initially affected by the military action. Income is the total change in local wages and salaries due to the proposed action, which includes the sum of the direct and indirect wages and salaries, plus the income of the civilian and military personnel affected by the proposed action. Population is the increase or decrease in the local population as a result of the proposed action.

The RCI initiative at Redstone Arsenal would require renovation of some existing housing, demolition of some existing housing, construction of new housing, and construction of supporting facilities such as utilities, roads, pedestrian trails, and tot lots. The developer estimated that the initial development period would be completed within a 4-year time frame (2006–2009). The current working estimate for the cost of demolition, renovation, and construction of these facilities ($26,409,365) was divided over the estimated 4-year initial development period and entered as the change in expenditures ($6,602,341 per year). The proposed action would not result in the loss of any jobs.

THE SIGNIFICANCE OF SOCIOECONOMIC IMPACTS

Once model projections are obtained, the Rational Threshold Value (RTV) profile allows the user to evaluate the significance of the impacts. This analytical tool reviews the historical trends for the defined region and develops measures of local historical fluctuations in sales volume, income, employment, and population. These evaluations identify the positive and negative changes within which a project can affect the local economy without creating a significant impact. The greatest historical changes define the boundaries that provide a basis for comparing an action's impact on the historical fluctuation in a particular area. Specifically, EIFS sets the boundaries by multiplying the maximum historical deviation of the following variables:

		Increase	***Decrease***
Sales Volume	X	100%	75%
Income	X	100%	67%
Employment	X	100%	67%
Population	X	100%	50%

These boundaries determine the amount of change that will affect an area. The percentage allowances are arbitrary, but sensible. The maximum positive historical fluctuation is allowed with expansion because economic growth is beneficial. While cases of damaging economic growth have been cited, and although the zero-growth concept is being accepted by many local planning groups, military base reductions and closures generally are more injurious to local economics than are expansion.

The major strengths of the RTV are its specificity to the region under analysis and its basis on actual historical data for the region. The EIFS impact model, in combination with the RTV, has proven successful in addressing perceived socioeconomic impacts. The EIFS model and the RTV technique for

measuring the intensity of impacts have been reviewed by economic experts and have been deemed theoretically sound.

The following are the EIFS inputs and output data and the RTV values for the ROI. These data form the basis for the socioeconomic impact analysis presented in Section 4.9.2.1.

EIFS REPORT: REDSTONE ARSENAL RCI EA

PROJECT NAME: Redstone Arsenal RCI EA

STUDY AREA

01083 Limestone County, AL
01089 Madison County, AL
01095 Marshall County, AL
01103 Morgan County, AL

FORECAST INPUT

Change In Local Expenditures	$6,602,341
Change In Civilian Employment	0
Average Income of Affected Civilian	$0
Percent Expected to Relocate	0
Change In Military Employment	0
Average Income of Affected Military	$0
Percent of Military Living On-post	0

FORECAST OUTPUT

Employment Multiplier	2.81	
Income Multiplier	2.81	
Sales Volume – Direct	$6,602,341	
Sales Volume – Induced	$11,950,240	
Sales Volume – Total	$18,552,580	0.11%
Income – Direct	$1,505,588	
Income - Induced	$2,725,114	
Income – Total (place of work)	$4,230,702	0.04%
Employment – Direct	48	
Employment – Induced	87	
Employment – Total	135	0.04%
Local Population	0	
Local Off-base Population	0	0%

RTV SUMMARY

	Sales Volume	Income	Employment	Population
Positive RTV	5.20%	6.13%	4.41%	1.53%
Negative RTV	-4.08%	-4.63%	-2.48%	-0.55%

RTV DETAILED

SALES VOLUME

Year	Value	Adj_Value	Change	Deviation	%Deviation
1969	2206704	11607264	0	0	0
1970	2422996	12066520	459257	-169080	-1.4
1971	2632132	12555270	488749	-139588	-1.11
1972	2878852	13300296	745026	116689	0.88
1973	3129866	13614917	314621	-313716	-2.3
1974	3480100	13607191	-7726	-636063	-4.67
1975	3830140	13750202	143011	-485326	-3.53
1976	4286966	14575685	825483	197146	1.35
1977	4767828	15209372	633687	5350	0.04
1978	5363430	15875753	666381	38044	0.24
1979	6001582	15964209	88456	-539881	-3.38
1980	6724958	15736401	-227807	-856144	-5.44
1981	7491556	15957015	220614	-407723	-2.56
1982	8142780	16285560	328545	-299792	-1.84
1983	9060008	17576416	1290856	662519	3.77
1984	10323982	19202607	1626191	997854	5.2
1985	11462456	20632420	1429814	801477	3.88
1986	12312942	21670778	1038358	410021	1.89
1987	13368332	22726165	1055387	427050	1.88
1988	14534998	23692047	965882	337545	1.42
1989	15811824	24666445	974398	346061	1.4
1990	16966310	25279802	613358	-14979	-0.06
1991	17990418	25546393	266591	-361746	-1.42
1992	19470794	26869696	1323303	694966	2.59
1993	20051976	26869649	-47	-628384	-2.34
1994	20865446	27125079	255430	-372907	-1.37
1995	22033538	27982593	857514	229177	0.82
1996	22663466	27876064	-106529	-734866	-2.64
1997	23942164	28730598	854534	226197	0.79
1998	25493132	30336829	1606231	977894	3.22
1999	26119888	30299069	-37759	-666096	-2.2
2000	27884134	31230230	931161	302824	0.97
2001	29008624	31619401	389171	-239166	-0.76
2002	30440868	32571730	952329	323992	0.99
2003	31999114	33599068	1027338	399001	1.19

INCOME

Year	Value	Adj_Value	Change	Deviation	%Deviation
1969	1138421	5988095	0	0	0
1970	1243891	6194577	206482	-105837	-1.71
1971	1353621	6456772	262195	-50124	-0.78
1972	1481261	6843426	386654	74335	1.09
1973	1625651	7071582	228156	-84163	-1.19
1974	1776573	6946401	-125181	-437500	-6.3
1975	1958302	7030304	83903	-228416	-3.25
1976	2196749	7468947	438643	126324	1.69
1977	2425284	7736656	267709	-44610	-0.58
1978	2731848	8086270	349614	37295	0.46
1979	3054613	8125271	39001	-273318	-3.36
1980	3372895	7892574	-232697	-545016	-6.91
1981	3803286	8101000	208426	-103893	-1.28
1982	4121774	8243548	142548	-169771	-2.06
1983	4538675	8805030	561482	249163	2.83
1984	5221743	9712442	907412	595093	6.13
1985	5775905	10396629	684187	371868	3.58
1986	6212209	10933488	536859	224540	2.05
1987	6733708	11447304	513816	201497	1.76
1988	7356287	11990748	543444	231125	1.93
1989	8000996	12481553	490806	178487	1.43
1990	8558921	12752792	271239	-41080	-0.32
1991	9094525	12914225	161433	-150886	-1.17
1992	9835354	13572788	658563	346244	2.55
1993	10109885	13547246	-25542	-337861	-2.49
1994	10551786	13717321	170075	-142244	-1.04
1995	11078565	14069777	352456	40137	0.29
1996	11438226	14069018	-759	-313078	-2.23
1997	12050251	14460302	391284	78965	0.55
1998	12840256	15279905	819604	507285	3.32
1999	13166020	15272583	-7323	-319642	-2.09
2000	14016731	15698739	426156	113837	0.73
2001	14632942	15949907	251168	-61151	-0.38
2002	15274481	16343695	393788	81469	0.5
2003	16113580	16919258	575563	263244	1.56

EMPLOYMENT

Year	Value	Change	Deviation	%Deviation
1969	160569	0	0	0
1970	161708	1139	-3884	-2.4
1971	161395	-313	-5336	-3.31
1972	167484	6089	1066	0.64
1973	172296	4812	-211	-0.12
1974	175028	2732	-2291	-1.31
1975	173629	-1399	-6422	-3.7
1976	178829	5200	177	0.1
1977	187110	8281	3258	1.74
1978	196631	9521	4498	2.29
1979	199462	2831	-2192	-1.1
1980	198726	-736	-5759	-2.9
1981	200186	1460	-3563	-1.78
1982	200921	735	-4288	-2.13
1983	211816	10895	5872	2.77
1984	226835	15019	9996	4.41
1985	239469	12634	7611	3.18
1986	248688	9219	4196	1.69
1987	261540	12852	7829	2.99
1988	272827	11287	6264	2.3
1989	280085	7258	2235	0.8
1990	287437	7352	2329	0.81
1991	287853	416	-4607	-1.6
1992	293266	5413	390	0.13
1993	301860	8594	3571	1.18
1994	300280	-1580	-6603	-2.2
1995	308927	8647	3624	1.17
1996	313804	4877	-146	-0.05
1997	320551	6747	1724	0.54
1998	328522	7971	2948	0.9
1999	330079	1557	-3466	-1.05
2000	335460	5381	358	0.11
2001	334809	-651	-5674	-1.69
2002	332455	-2354	-7377	-2.22
2003	336381	3926	-1097	-0.33

POPULATION

Year	Value	Change	Deviation	%Deviation
1969	353377	0	0	0
1970	360493	7116	1368	0.38
1971	366672	6179	431	0.12
1972	370579	3907	-1841	-0.5
1973	373685	3106	-2642	-0.71
1974	375305	1620	-4128	-1.1
1975	378743	3438	-2310	-0.61
1976	383223	4480	-1268	-0.33
1977	387981	4758	-990	-0.26
1978	392290	4309	-1439	-0.37
1979	395521	3231	-2517	-0.64
1980	399662	4141	-1607	-0.4
1981	402284	2622	-3126	-0.78
1982	406538	4254	-1494	-0.37
1983	412448	5910	162	0.04
1984	419093	6645	897	0.21
1985	427907	8814	3066	0.72
1986	435528	7621	1873	0.43
1987	444213	8685	2937	0.66
1988	452339	8126	2378	0.53
1989	458922	6583	835	0.18
1990	465920	6998	1250	0.27
1991	476066	10146	4398	0.92
1992	488383	12317	6569	1.35
1993	501834	13451	7703	1.53
1994	509180	7346	1598	0.31
1995	511722	2542	-3206	-0.63
1996	515830	4108	-1640	-0.32
1997	520454	4624	-1124	-0.22
1998	528063	7609	1861	0.35
1999	532234	4171	-1577	-0.3
2000	537321	5087	-661	-0.12
2001	541949	4628	-1120	-0.21
2002	547998	6049	301	0.05
2003	554564	6566	818	0.15

****** End of Report ******

APPENDIX E

Solid Waste Calculations

Action	Debris (lb/sf)
Renovation	20
Demolition	115
Construction	4.4

CDMP/End St 243	Existing	Demolish	Construct	Renovate	End State
HA1	96	96	0	0	0
HA2	46	0	0	46	46
HA3	49	46	5	0	8
HA4a	25	0	0	0	25
HA4b	71	0	0	0	71
HA5	56	0	0	56	56
HA6	66	42	0	24	24
HA10a	48	35	0	13	13
	457	**219**	**5**	**139**	**243**

DEBRIS GENERATION (lb)

Demo	Const	Renov
12,415,860		
		1,328,320
8,961,571	37,269	
		1,509,200
5,409,600		537,600
6,037,500		390,000
32,824,531	**37,269**	**3,765,120**

DEBRIS GENERATION (ton) **(243 end state)**

Demo	Const	Renov		
6,208				
		664		
4,481	19			
		755		
2,705		269		
3,019		195		
16,412	**19**	**1,883**	**Total:**	**18,313**

CDMP/End St 363	Existing	Demolish	Construct	Renovate	End State
HA1	96	0	0	0	96
HA2	46	0	0	46	46
HA3	49	46	5	0	8
HA4a	25	0	0	0	25
HA4b	71	0	0	0	71
HA5	56	0	0	56	56
HA6	66	18	0	24	48
HA10a	48	35	0	13	13
	457	**99**	**5**	**139**	**363**

DEBRIS GENERATION (lb)

Demo	Const	Renov
		1,328,320
8,961,571	37,269	
		1,509,200
2,318,400		537,600
6,037,500		390,000
17,317,471	**37,269**	**3,765,120**

DEBRIS GENERATION (ton) **(363 end state)**

Demo	Const	Renov		
		664		
4,481	19			
		755		
1,159		269		
3,019		195		
8,659	**19**	**1,883**	**Total:**	**10,560**

ACRONYMS and ABBREVIATIONS

ºF	degrees Fahrenheit
ACHP	Advisory Council on Historic Preservation
ACM	asbestos-containing material
ADEM	Alabama Department of Environmental Management
ALNHP	Alabama Natural Heritage Program
AR	Army Regulation
AST	aboveground storage tank
AWOL	Absent without leave
BAH	Basic Allowance for Housing
BMP	best management practice
BOCA	Building Officials and Code Administrators International, Inc.
BR	bedroom
CAC	Community Activity Center
CDMP	Community Development and Management Plan
CEQ	Council on Environmental Quality
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
DA	Department of the Army
DoD	Department of Defense
EA	Environmental Assessment
EBS	Environmental Baseline Survey
EIFS	Economic Impact Forecast System
ESA	Endangered Species Act
FNSI	Finding of No Significant Impact
FPPA	Farmland Protection Policy Act
GOQ	General Officer Quarters
ICRMP	Integrated Cultural Resources Management Plan
IRP	Installation Restoration Program
LBP	lead-based paint
LLC	limited liability company
MAHC	maximum acceptable housing cost
MHPI	Military Housing Privatization Initiative
msl	above mean sea level
MP	Military Police
MWR	Morale, Welfare, and Recreation
NAGPRA	Native American Graves Protection and Repatriation Act
NASA	National Aeronautics and Space Administration
NCO	non-commissioned officer
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
OMEMS	U.S. Army Ordnance, Munitions and Electronics Maintenance School
OOP	Out-of-Pocket (expenses)
OSHA	Occupational Safety and Health Administration
PCB	polychlorinated biphenyls
PCPI	Per Capita Personal Income
pCi/L	picocuries per liter

ppm	parts per million
PX	Post Exchange
RAFH	Redstone Army Family Housing, LLC
RCI	Residential Communities Initiative
RCRA	Resource Conservation and Recovery Act
RFQ	Request for Qualifications
ROI	Region of influence
RONA	Record of Non-applicability
RTV	Rational Threshold Value
SAS	School Age Services
SHPO	State Historic Preservation Officer
SWPPP	Storm Water Pollution Prevention Plan
TSCA	Toxic Substances Control Act
TVA	Tennessee Valley Authority
U.S.	United States
U.S.C.	United States Code
USEPA	U.S. Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
UST	underground storage tank